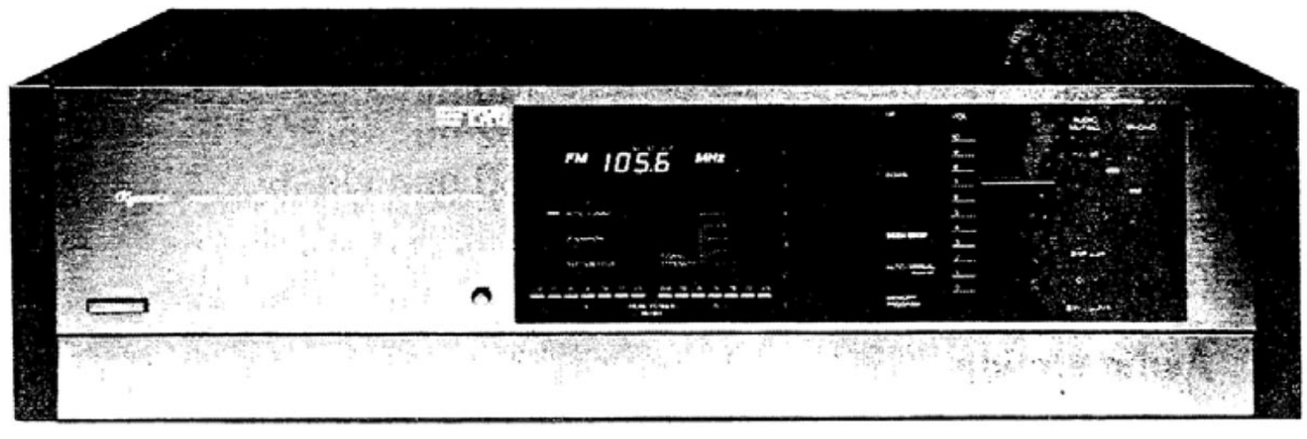
Service Manual

R-651 STEREO RECEIVER



Kyocera

Cybernet Service Center

7 Powder Horn Drive, Warren, NJ 07060 (201-560-0060)

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Specifications

General

Power requirement	AC 120V 60 Hz
Dimensions: Width	460 mm (18-1/8")
Height	132 mm (5-3/16")
Depth	369 mm (14-17/32")
Accessory	
Instruction manual	1

① Audio section

Power output **65 watt**
RMS, both channels driven, with minimum THD at 8 ohm/channel.

Total harmonic distortion	
at rated output	0.015%
Intermodulation distortion	
at rated output	0.015%
Frequency response	
20 to 20,000 Hz	±0.3 dB
Slew rate	60V/microsec.
Rise time	1.0 microsec.
Input sensitivity	
at rated output — phono	2.5 mV/47 kohm
others	150 mV/30 kohm
Maximum input voltage	
at 1 kHz 0.5% THD — phono	150 mV
Hum and noise ratio	
IHF, shorted circuited, A-weighted	
for rated output.— phono	82 dB
others	100 dB
Damping factor	
at 8 ohm, 1 kHz	50
Parametric equalizer level control	
BASS (at turn-over 500 Hz)	±10 dB at 100 Hz
TREBLE (at turn-over 2 kHz)	±10 dB at 10 kHz
Turn-over frequency control	
BASS control	100 to 500 Hz variable
TREBLE control	2 to 10 kHz variable
SUBSONIC filter (12 dB/oct)	—3 dB (20 Hz)
HI FIL (High filter) (6 dB/oct)	—6 dB (10 kHz)

② FM section

Tuning range	87.5 to 108 MHz
Usable sensitivity	
mono	10.1 dBf
50 dB quieting sensitivity	
mono	15.5 dBf
stereo	36.5 dBf
Capture ratio	1.0 dB
Distortion	
mono 1 kHz	0.07%
stereo 1 kHz	0.1%
Separation	
1 kHz	55 dB
BLEND (High-blend)	
at 1 kHz	20 dB
Frequency response	
30 to 15,000 Hz	±0.5 dB
Signal-to-noise ratio	
A-weighted — mono	86 dB
stereo	78 dB
Stereo threshold	25 dBf or 45 dBf
Muting threshold high	50 dBf
low	25 dBf
Selectivity	
alternate channel: ±400 kHz	75 dB
Spurious rejection	80 dBf
IF rejection	110 dB
Image rejection	72 dB
Subcarrier rejection ratio	65 dB
Recording output	0.75V
Antenna provision	Unbalanced 75 Ohm
Indicators	
signal strength	5-dot LED (green)
stereo	LED (red)
station	LED (green)
station preset	7 LED's (green)

③ AM section

Tuning range	520 to 1,710 kHz
Sensitivity	
loop antenna S/N = 20 dB	300 microvolt/m
Image rejection	50 dB
Signal-to-noise ratio	50 dB
IF rejection	85 dB
Selectivity	
±20 kHz	45 dB
Distortion	0.3%
Frequency response	
at —6 dB	20 to 2,300 Hz
Recording output voltage	0.3V
Antenna provision	a — ferrite loopstick antenna b — external antenna terminal
Signal strength indication	5-dot LED (green)

④ Digital control section

Frequency space	
AM	10 kHz
FM	100 kHz
End-to-end sweep time	
AM	12 sec.
FM	20 sec.

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Circuit description

Phono preamplifier (PSSW261C0X)

The phono preamplifier is designed for moving-magnet type cartridge acceptance and has the input sensitivity of 2.5 mV for the rated nominal audio output. This circuit has the RIAA network elements, wired within the feedback loop, with a very low impedance, and high-output-current operational amplifiers to give sufficient gain of amplification. A multiple dc feedback system (R312L and C307) is employed since direct-coupled FETs are used in the input stage and to achieve a dc balance in the output (phono preamplifiers have a large gain in the low frequency region).

Flat amplifier and tone control amplifiers (PSPT018C0X)

A high-speed low-noise dual operational amplifier (U402) is used for the flat amplifier which has a gain of 17 dB. A 12 dB/octave subsonic filter circuit is provided within the flat amplifier circuit.

A low-noise operational amplifier U401 is used as an adder of reverse amplifier configuration. Q401 acts as the active elements for high-pass filter; Q402 for low-pass filter. The level and the phase of signals entering the low-pass filter are controlled by VR403 (BASS) and sent to the adder-circuit for bass boost and cut action. Whereas, VR401 (TREBLE) controls the level and the phase of signals entering the high-pass filter for treble boost and cut action. The parameteric equalizer controls VR402 (TREBLE) and VR404 (BASS) change the turn-over roll-off frequency of the bass and treble tone control circuit continuously.

Main amplifier (PSMA049C0X)

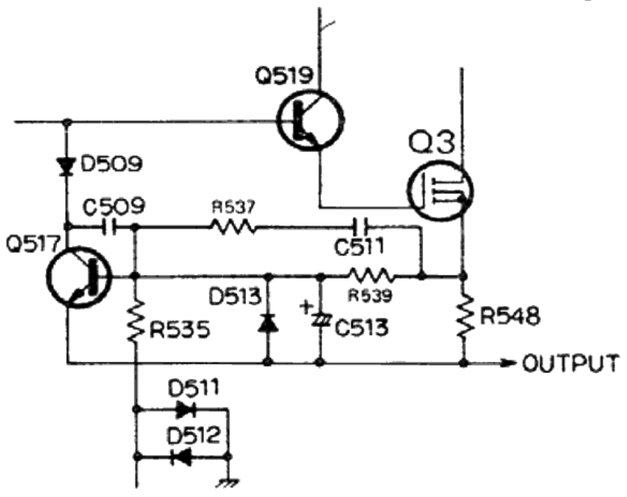
Q501 and Q502 are wired to the input stage of the main amplifier in a cascode boot-strap configuration, to Q503, a low-noise differential amplifier. Q504 is the current regulator for the stable performance of the differential amplifier. The emitter-follower outlet of Q506 and Q507 enables very low impedance signal outage for improvement in high frequency response of the next stage. The output from the differential amplifier is reversed by Q505 and amplified by the push-pull amplifier Q508 and Q509. The complimentary emitter-follower amplifier Q519 and Q520 drives the final MOSFET with a very low impedance signal outage. Though the main amplifier operates on a AB-class basis fundamentally, transistors Q510 through Q516, the variable bias circuit, act to prevent the cut-off condition of final MOSFETs, thus allowing the main amplifier to operate like on a A-class basis.

The unique SOA (safety operating area) protector with a time constant has been provided to avoid damaging the final MOSFETs.

A dc servo circuit is used to ensure dc balance in the output employing low-noise dual gate operational amplifier U501 and U502. This circuit uses the one part of a dual operational amplifier as a very low-frequency integration circuit which detects the dc drift in the signal output, and using another part to reverse and amplify and send it to feedback loop of the main amplifier, thus finally realizing dc balance.

SOA (safety operating area) protector.

Refer to simplified schematic diagram.



Note that this integration circuit has a time constant determined by the combination of R541 and C513.

When a plus swing of signal is applied to R548, assuming that C513 is not provided in the circuit, Q517 turns on at the constant voltage across R548 and regardless of the plus half swing width.

However, there actually is C513 provided, turning-on potential of Q517 is determined not by the voltage across R548 but integration of all plus half swings.

When a plus input is applied, the wider the pulse width, the greater the voltage across R548 (current through R548) at which Q517 turns on.

This means that the SOA limit is varied in accordance with the pulse width (or pulse frequency). As the frequency of signal becomes higher, the increment of current flowing into P ch FET from N ch FET disturbs the perfect switching, although the signal flowing through R548 is perfect pulse half cycle wave.

Since C513 can act to short the current from N ch FET to P ch FET out, the provision of C513 may prevent the operation of the protector action although the current increases. This is avoided by providing R542 and C511 bypass circuit which transfers voltage across R548 directly to Q517 base if a signal of higher than a certain frequency is input.

Thus, the Pc limit area of the SOA circuit moves outward and the SOA becomes wider as the input signal frequency incrases from dc (narrowest) to higher frequency region. Whereas, the Pc limit area moves inward from the point at which input signal frequency exceeds the cut off frequency of the bypass circuit and the SOA is narrowed. The reasons why the widest SOA is required in mid-range frequency range are that (1) the MOSFETs used for this amplifier have wider SOA against narrow-width pulse type signals than against wider-width pulse type signals and dc, and (2) in high frequency range, the SOA is narrowed purposely.

Variable bias system

When a plus half swing of a sine wave is applied to the load in the following simplified diagram, the base potential of Q520 rises by the level expressed as ID1 x R548 + VGS1. Current which flows through R528 lowers

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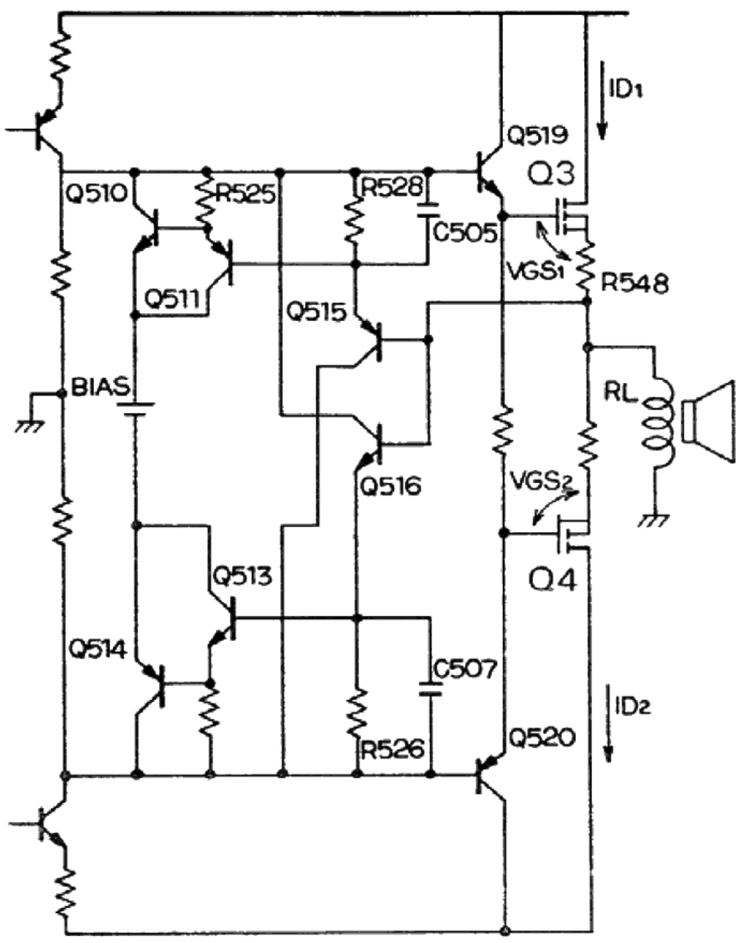
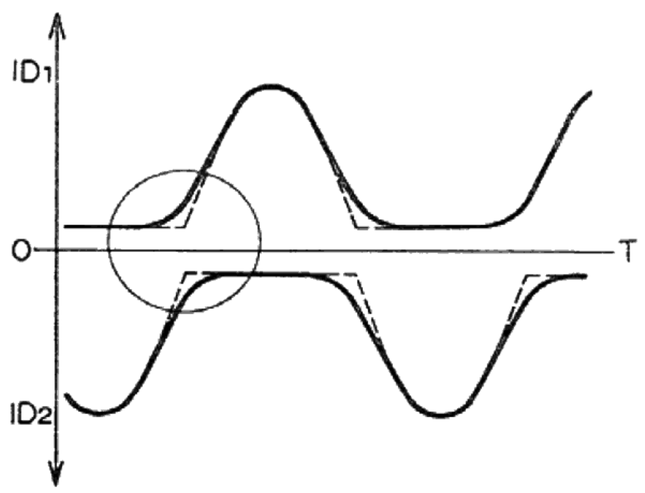
the emitter voltage of Q517, this in turn lowers the emitter voltage of Q511. Thus, as the emitter voltage of Q511 is reduced, Vce of Q510 is also reduced. Finally, the base voltage of Q520 is lowered and thus the base potential of Q519 and Q520 is higher than that at class-B operation, thus preventing Q2 cut-off.

VARIABLE BIAS





Speaker protector/Relay driver (PSPW063C0X)

The speaker protector circuit contains an IC U503 and transistors Q521 and Q522. This circuit detects dc potential at the amplifier output as well as over current flow, activating the relay K-501 (on PSMA049C0X) which usually connects the audio output to the speakers. This circuit also contains a delay factor to eliminate transient shock noises during turn on or turn off.

IC U801 which produces ±16.5V dc as determined by R801 and R802. The output current is boosted by Q801 (plus) and Q802 (minus). Q803 (+14.5V), Q804 (+16V) and Q805 (+30V) determine the supply voltage corresponding to the requirement of the applicable tuner stage. CN503 feeds ac 1.5V for driving the heater of the digital display tube.

Power supply/Regulator

The transformer used has two secondary windings — one (AC 40V x 2) has a large carrent capability and connected to the rectifier on PSPW064C0X and produces ±52V dc for the main amplifier, another (AC 22V x 2) has a smaller current capability and connected to the rectifier on PSMA049C0X for the supply to all the operational amplifiers. The latter power supply is then fed to the dual-tracking regulator

FM local oscillator.

Q104 acts as the oscillator, Q103 as a buffer amplifier for prescaler input. Q104 output is sent to Q103 through an emitter follower configuration, ensuring very low impedance signal transfer. Emitter-grounded configuration of Q103 prevents S/N being degraded caused by the vibration of coaxial cables. Q105 acts as the buffer for the local injection and prevents the drift of the local signal caused when receiving strong FM stations. With the effect of the AGC and the buffer, even with 135 dBf antenna input, THD at 1 kHz is still less than 0.05%.

FM front end.

A low noise FET 3SK45 is used for RF amplifier. A twin type variable-capacitance diode of high voltage bias (30V) is used to endure strong FM signals.

AGC signal is applied to the 2nd gate of the RF amplifier Q101. The AGC operates with more than 80 dBf level of FM signals and the change in the AGC level is from 4V to −0.6V.

Since the AGC circuit has a wide triggering range, adjacent strong signals also actuate the AGC circuit, thus reducing the possibility for RF intermodulation interference. A dual gate FET is used for the mixer. Local oscillator signal which is 10.7 MHz higher than the desired FM station is injected to the 2nd gate of the transistor through C127 from Q105.

FM IF amplifier.

The FM IF amplifier has two bandwidth mode — normal and narrow. In normal mode, IF signal passes through ceramic filters — FL101 and FL102 and enters U104. Whereas, in narrow mode, it passes through FL103, FL104, FL105 and FL102 and enters U104. U104 is integrated with IF limiter amplifier and quadrature circuit. This IC has superb AM rejection ratio and very low distortion less than 0.015%.

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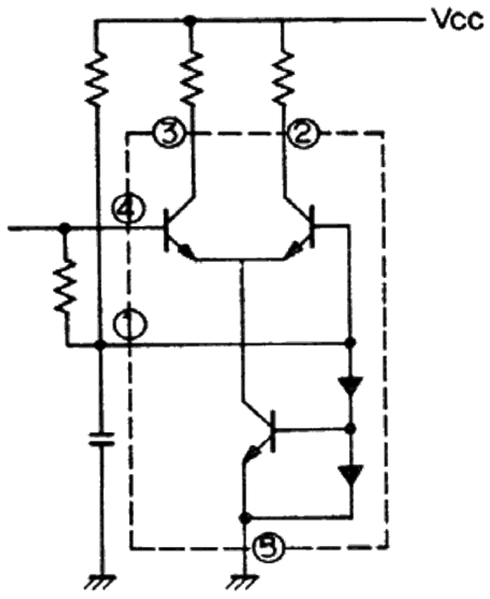
U101/
U102
M5215L



Normal IF mode: Q208 turns on and D110 conducts to switch T106 in the IF circuit. The output is obtained from #2 terminal of U101 and sent to FL101, D116 and reaches U102. AGC voltage divided with R139 and R140 enters the 2nd gate of Q101 through D108. The signal is sent to U102, FL102, and to U104. The detected signal appears at #6 terminal and sent to the multiplexer.

Narrow IF mode: Q207 turns on and D111 conducts to switch T107 and T108 into the IF circuit. The IF signal is amplifier by Q106 and sent to FL103, U103, FL104, FL105, D117, U102, FL102 and to U104. The detected output appears at #6 terminal of U104 and through R172 amplified by 6 dB finally reaching the multiplexer.

Scan-stop circuit.

Scan-stop command is derived when the following conditions are met in an AND circuit:

(1) When the potential at #12 terminal of U104 is 0V. This occurs when an input signal level exceeds the mute level and the potential between #7 and #10 terminal of U104 is 0 (namely, IF is exactly tuned to 10.7 MHz ± 30 kHz). If two stations are being received e.g. one at 98.1 MHz and another at 98.5 MHz, input level at 98.3 MHz will exceeds the mute level since those stations are held within the bandwidth of ceramic filters. In this condition potential between #7 and #10 terminals of U104 becomes 0V, and the scan is stopped as if there were an FM station transmitting on 98.3 MHz. To prevent above mistuning when receiving 2 stations located closely on frequency, a very narrow bandwidth crystal filter is used to restrict the bandwidth within which the desired station is picked up by scanning.
Thus, even at ±75 kHz deviation of both 98.0 MHz station and 98.7 MHz station, no signal component is detected at 98.3 MHz ± 30 kHz, and mistuning is prevented.

(2) S-meter drive signal detection. When the 1st dot of the SIGNAL STRENGTH indicators lights, scan speed gets slow down to half the normal speed to avoid mis-tuning caused by delayed response of the PLL and AGC action.
Signal at #3 terminal of U102 enters FL201 and amplified and peak-detected by U205 and appears at #13 terminal. At the reception of an FM station, pulse output at #13 terminal turns on Q218 and C245 discharges through D224. When #12 terminal of U104 becomes 0V, the AND circuit of D217 and D223 sets Q216 to off, and the collector voltage of Q216 becomes 5V. Now Q214 turns on through D214 and the STATION indicator (LED910) illuminates. The collector voltage of Q214 is then 0V and consequently #32 terminal of U902* becomes 5V too, thus a station is detected. When #1 terminal of U211*, S-meter driver turns on, Q231* turns on, 5V signal (divided by R293 and R294) is applied to #33 terminal of 902, finally introducing the scan-stop. The condition for scan-stop thus requires that the potential at both #32 and #33 terminals of U902 simultaneously be 5V. (*: located on PSCZ024C0X)

Mute

Two mute circuits are provided – one at the IF output and the other at the FM detector. For output muting, muting signal achieved at #28 terminal of U902* sets the output of U202 (#5 terminal) to 0 through D210 and connector T15. This turns on Q213 and sets the gates of Q221 and Q222 to 0V. Thus muting occurs. (Normally, the gates of Q221 and Q222 are biased with –15V through R271 for cut-off.) For detector mute, with no signal condition, Q216 turns on, the output of U202 is 5V. In auto tuning mode, Q215 is biased by 5V through #8 terminal of U902*. This turns on Q215 and #5 terminal of U104 is applied with 3V and no output is obtained from #6.
During the unit is operating in other than FM mode, Q217 turns off to mute the IF section through D216. During FM mode, Q203 turns on and AM output line is muted.
(*: located on PSCZ024C0X)

FM multiplexer

U201 contains a preamplifier whose input is #2 terminal and the output is #3 terminal. The composit signal output from #3 terminal is time-shared by switching at #5 and #6 terminal for left and right channel signals. The left channel signal enters the post amplifier #7 and #9 terminals) through R252. An NF type deemphasizer is used using R260 and C226. The right channel signal also enters the post amplifier (#8 and #9 terminals). The switching signal from #5 and #6 terminals is used. This signal is amplified in reversed phase and output at #4 terminal. These signals are blended with RV203 and RV204 which adjust the separation. Q220 turns on at narrow mode to increase the amount of blend because the amount of this blending (cancellation) may vary when switching between normal – narrow mode.
The 19 kHz signal is fed through R246, T115 and input to #20 terminal. PLL signal is locked onto this signal and used for 38 kHz switching. The time constant for produce 76 kHz VCO signal is determined by C241, R276, RV205

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at #16 terminal. Pilot-cancelling 19 kHz signal divided from 76 kHz signal is obtained at #13 terminal and integrated with C224 for a triangle wave which is blended in reverse phase by RV206 at #2 terminal.
During operation on other than FM mode, #14 terminal is grounded through R279 to deactivate the VCO.
Switching between mono-stereo mode is made by Q219. With a station come in, Q216 turns off and the output of U202 is 0V. Then, Q219 turns on to feed current to #12 terminal of U201 and the unit is set to stereo mode. When a pilot signal is applied, U201 is engaged to stereo mode.
During stereo mode, current flowing into R282 is applied to #12 terminal of U201 and the potential at #12 terminal decreases. This means no current flows through D222, the STEREO indication being thus made.
In no pilot signal condition, #12 terminal is off and current flowing through R282 is applied to D222, connector T18 and turns on Q911* to turn off the STEREO indicator.
When the mono-stereo switch is set to mono and/or the strength of incoming signal is lower than the mute level, base bias current for Q219 does not flow, but the current is led to R281, D221, and connector T18 and turns on Q911* to deactivate the STEREO indicator.

AM operation

AM RF signal enters #3 terminal of U106 and amplifier output is achieved at #5 terminal. R186 is the load for the RF amplifier. The signal also enters the mixer through C176 then to #7 terminal, T112, T113 and IF amplified signal appears at #10 terminal. The signal is detected by T114 and the audio output is achieved at #13 terminal.
AGC is applied from #13 terminal through R180 and R179 and to #17 terminal. To avoid delayed AGC action at scan-stop, Q107 turns on with the mute signal. SIGNAL-meter drive signal and station signal is selected by the narrow bandwidth filter FL107 and output at #16 terminal. This signal is connected to SIGNAL-meter drive line and also used to turn on Q214 to settle a station signal.

PLL controller (*: PSCZ024C0X)

The selection of AM or FM mode is determined by the high/low status of #4 and #5 terminal of U902. In FM mode, 4.7V is applied to connector F3 through connector F1 and FM switch. At the same time Q804** turns off through B5 to deactivate the fluorescent indicator. At this moment, muting signal is applied through D914. #7 and #8 terminals of U902 are used to establish the auto or manual tuning mode.
When a high level signal is applied to I/O input momentarily U902 holds it and outputs a high level signal. e.g. #7 terminal is applied with a high level, C920 is charged through R914 and the level becomes high. Pressing S912 causes a triggering pulse supplied through C921 and one-shot-pulse is applied to #8 terminal of U902 through D913. Since C919 is charged with low level at this moment, D912 does not get high level and #8 terminal holds high level. When S912 is pressed again, above procedure is reversed.
The other terminals of U902 engages in the following functions:
#22 and #23: connections for scan-oscillator (#25, 26, 27).
#28: mute output.
#32 and #33: scan-stop input, S911 is the scan-stop switch, high level signals are input from D907 and D908 simultaneously.
#35: phase detector output, connected to LPF.
#37: Accepts FM local signal time-shared by U901.
#39: accepts AM local signal.
#40: 0V condition introduces an inhibit status, backed-up with V901.
(**: PSMA049C0X)

(high level signal is 4 ~ 5V
low level signal is 0 ~ 0.6V)

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Adjustment

Note: Unless otherwise specified, use 120V 60 Hz ac power and 8 ohm load to each channel.

① Tuner-FM (PSTU066C0X board)

Station preset for test
For the servicing convenience, preset the following frequencies into the memory pushbuttons:

1	87.5 MHz
2	90.1 MHz
3	98.1 MHz
4	106.1 MHz
5	108.0 MHz
6	108.0 MHz
7	108.0 MHz

To put these frequencies into memory, refer to the operation manual accompanying the unit.

Local oscillator tracking
1: Connect tester across L103 and ground. Use tester with a high input impedance.
2: Tune unit to 108.0 MHz and adjust CT105 to 27V.
3: Tune unit to 87.5 MHz and adjust T105 to 2.2V.
4: Repeat steps 2 and 3 until 2.2V ±0.05V is obtained at 87.5 MHz and 27.0V ± 0.5V at 108.0 MHz.
(New lot is 6.5V ~ 27V)

Front-end tracking
1: Tune unit to 90.1 MHz. Apply 90.1 MHz test signal to the unit. Connect oscilloscope to speaker terminals. Adjust T102 to T104 alternately for maximum scope display.
Note. Reduce the output level of signal generator according to the increment of the sensitivity.
2: Tune unit to 106.1 MHz. Apply 106.1 MHz test signal. Adjust CT102 to CT104 alternately for maximum scope display.
3: Repeat steps 1 and 2 until the maximum sensitivity of the unit is obtained at both frequencies.

IF amplifier
1: Tune unit to 98.1 MHz. Apply 98.1 MHz test signal. Set the **IF norm-narrow** switch to **norm**. Adjust T106 for maximum output.
2: Set the **IF norm-narrow** switch to **narrow**. Adjust T107 and T108 for maximum output.

THD adjustment
1: Tune unit to 98.1 MHz. Apply 98.1 MHz test signal, the level being 65 dBf.
2: Set **IF norm-narrow** switch to **norm**. Connect tester across #7 and #10 terminals of IC U104. Adjust T109 for ±20 mV.
3: Connect distortion meter to Tape output terminals. Adjust T110 for minimum THD.
Note. Adjusting T110 may upset the triggering timing of the STATION LOCK indicator. To avoid this, repeat steps 2 and 3 alternately until minimum THD is obtained and also the voltage across #7 and #10 terminals becomes ±20 mV. (The THD should be less than 0.07%.)
4: Set the **IF norm-narrow** switch to **narrow**. Check THD is now less than 0.25%.

Mute level
1: Tune unit to 98.1 MHz. Apply 45 dBf test signal. Set the **IF norm-narrow** switch to **norm**. Set the **MUTE** switch to **high**. Operate the **AUTO/MANUAL** switch to introduce auto mode.
2: Rotate RV201 clockwise until the **STATION** indicator illuminates and simultaneously mute is released.
3: Set the **FM MUTE** switch to **low**. Apply test signal, 20 to 33 dBf level. Check the **STATION** indicator illuminates.

Scan-stop
1: Set the **FM MUTE** switch to **low**. Apply 33 dBf test signal. Check scanning stops in either upscale or downscale tuning.
2: Set the **FM MUTE** switch to **high**. Apply 47 dBf test signal. Check scanning stops in either upscale or downscale tuning.

Multiplexer-76 kHz adjustment
Apply 65 dBf test signal, non modulated, from signal generator. Connect frequency counter to R278. Adjust RV205 to 76 kHz ±20 Hz.

Separation
1: Use multiplex signal generator in (L-R) mode. Adjust T115 for maximum signal output.
2: Apply left channel signal only. Adjust RV204 for minimum signal output in right channel.
3: Apply right channel signal only. Adjust RV203 for minimum signal output in left channel.
4: Set the **IF norm-narrow** switch to **narrow**. Check the separation is now more than 33 dB.
5: Apply 7% pilot and check that unit switches to stereo mode.

SIGNAL STRENGTH indicator alignment
Set the **IF norm-narrow** switch to **norm**. Check the 1st dot of the SIGNAL STRENGTH indicator illuminates with 20 to 33 dBf signal and all 5 dots illuminate with 58 to 75 dBf signal.

② Tuner-AM (PSTU066C0X board)

Station preset for test
For the servicing convenience, preset the following frequencies into the memory pushbuttons:

1	520 kHz
2	600 kHz
3	1000 kHz
4	1400 kHz
5	1710 kHz

To put these frequencies into memory, refer to the operation manual accompanying the unit.

Local oscillator tracking
1: Connect tester across L103 and ground.
2: Tune unit to 520 kHz. Adjust T111 to 1.45V.
3: Tune unit to 1710 kHz. Adjust CT106 to 24V.
4: Repeat steps 2 and 3 until 1.45 ±0.05V is obtained at 520 kHz and simultaneously 24V ± 0.5V at 1710 kHz.

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IF amplifier
1: Tune unit to 1000 kHz. Apply 1000 kHz test signal.
2: Adjust T112, T113, and T114 for maximum output.

Sensitivity
1: Pull out loopstick antenna on the unit rear panel outward fully. Connect test loop antenna to AM signal generator output. Locate the loop antenna more than 1 ft. apart from the unit loopstick antenna.
2: Tune unit to 600 kHz. Adjust signal generator to 600 kHz, modulated with 400 Hz for 30% modulation. Adjust the loop stick antenna core for maximum output.
3: Tune unit to 1400 kHz. Adjust signal generator to 1400 kHz. Adjust CT107 to maximum output.
4: Repeat steps 2 and 3 until maximum output is obtained on both frequencies.
Note. After completing step 4, the output level at 1000 kHz is within ±3 dB.

Scan-stop
1: Apply test signal of 55 dBu/m, 1000 kHz modulated 30% with 400 Hz audio. Locate test loop antenna (connected to signal generator) 2 ft. apart from the loop stick antenna.
2: Adjust RV101 so that 1st dot of the **SIGNAL STRENGTH** indicator illuminates. Check the **STATION** indicater illuminates simultaneously.
3: Select automatic tuning mode. Check scanning stops in either upscale or downscale tuning.

SIGNAL STRENGTH indicator
Apply 80 dBu/m test signal from signal generator. Check 5th dot of the **SIGNAL STRENGTH** indicator illuminates.

③ Audio (PSMA049C0X board)

Idling current adjustment
1: Rotate the VOLUME control to minimum, no signal.
2: Left channel: Connect tester across the source of Q3 and to the point at which diodes D515L and D516L are connected.
Adjust RV501L to 22.5 mV ±2.5 mV.
3: Right channel: Connect tester across the source of Q1 and to the point at which diodes D515R and D516R are connected.
Adjust RV501R to 22.5 mV ±2.5 mV.

PEAK POWER indicator alignment (PSSW262C0X)
1: Set the **DISPLAY** switch to off (released).
2: Use audio generator and rotate the **VOLUME** control clockwise properly to achieve 65 W/8 ohm on both channels (22.8V across 8 ohm load).
3: Adjust RVS01 so that up to 7 dots of the **PEAK POWER** indicator of left channel illuminate.
4: Adjust RVS02 so that up to 7 dots of the **PEAK POWER** indicator of right channel illuminate.
5: Reduce audio generator by −10 dB and depress the **DISPLAY** switch to **x0.1**. Check 6th or 7th dot of the **PEAK POWER** indicator illuminate.

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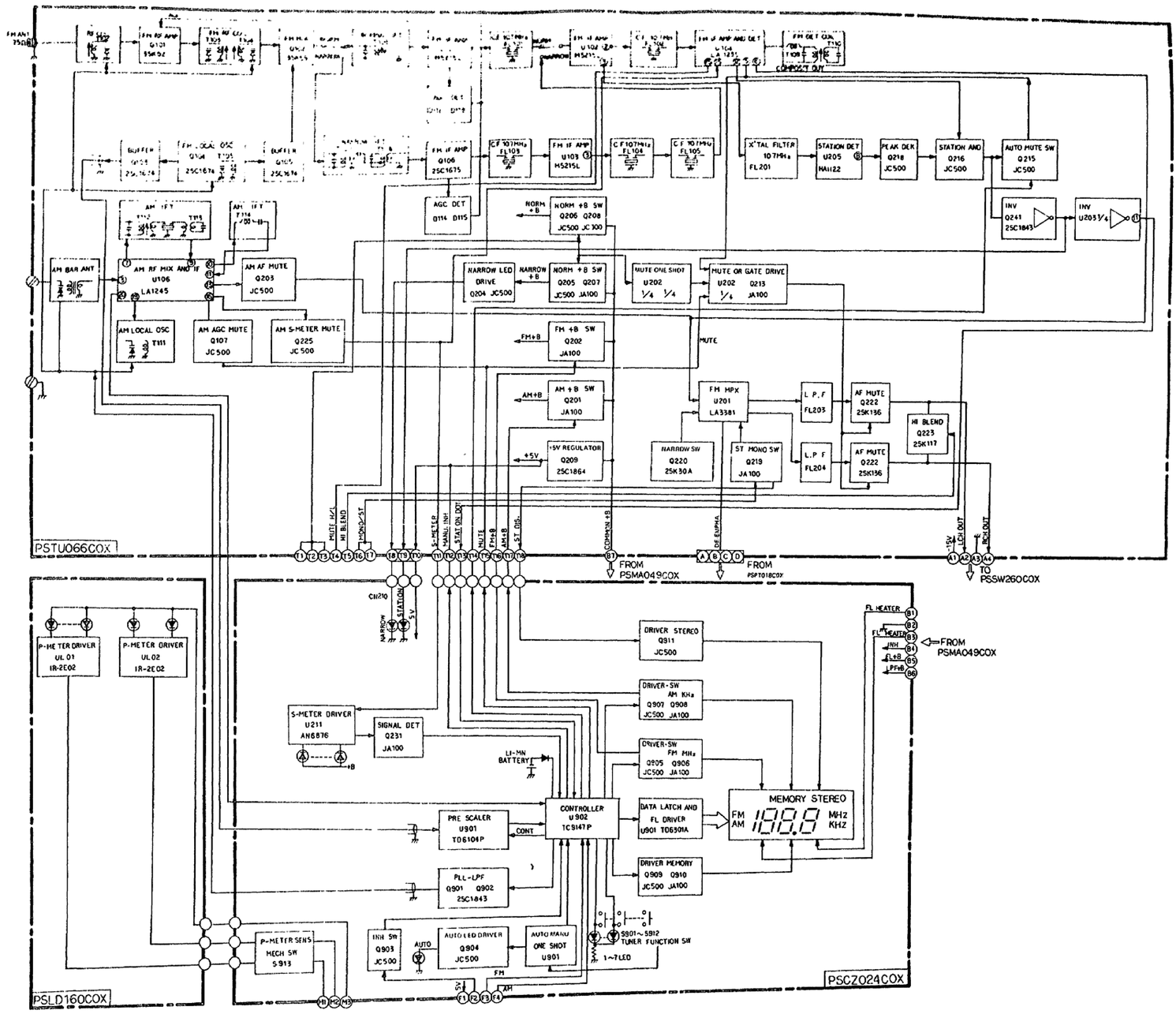
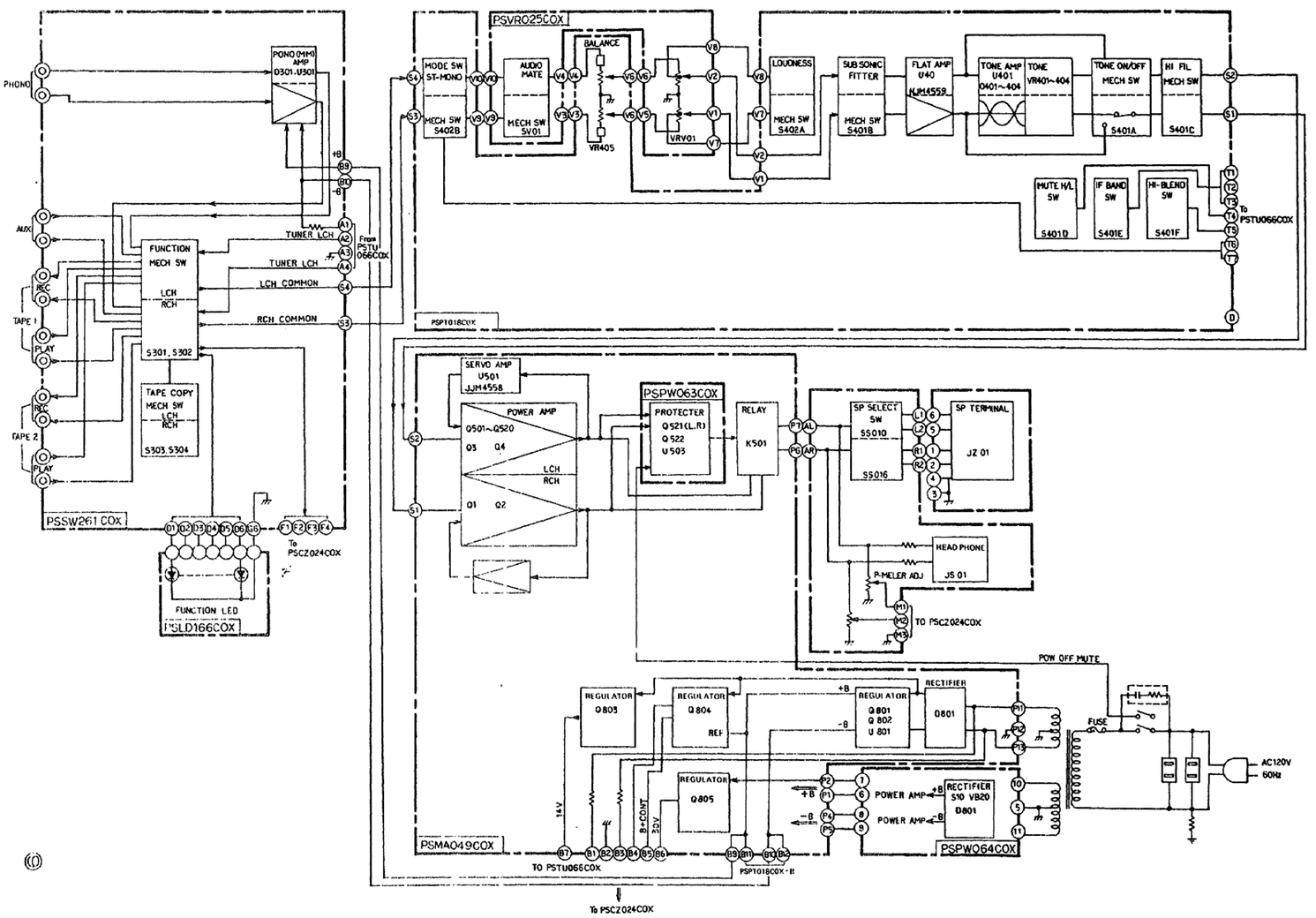
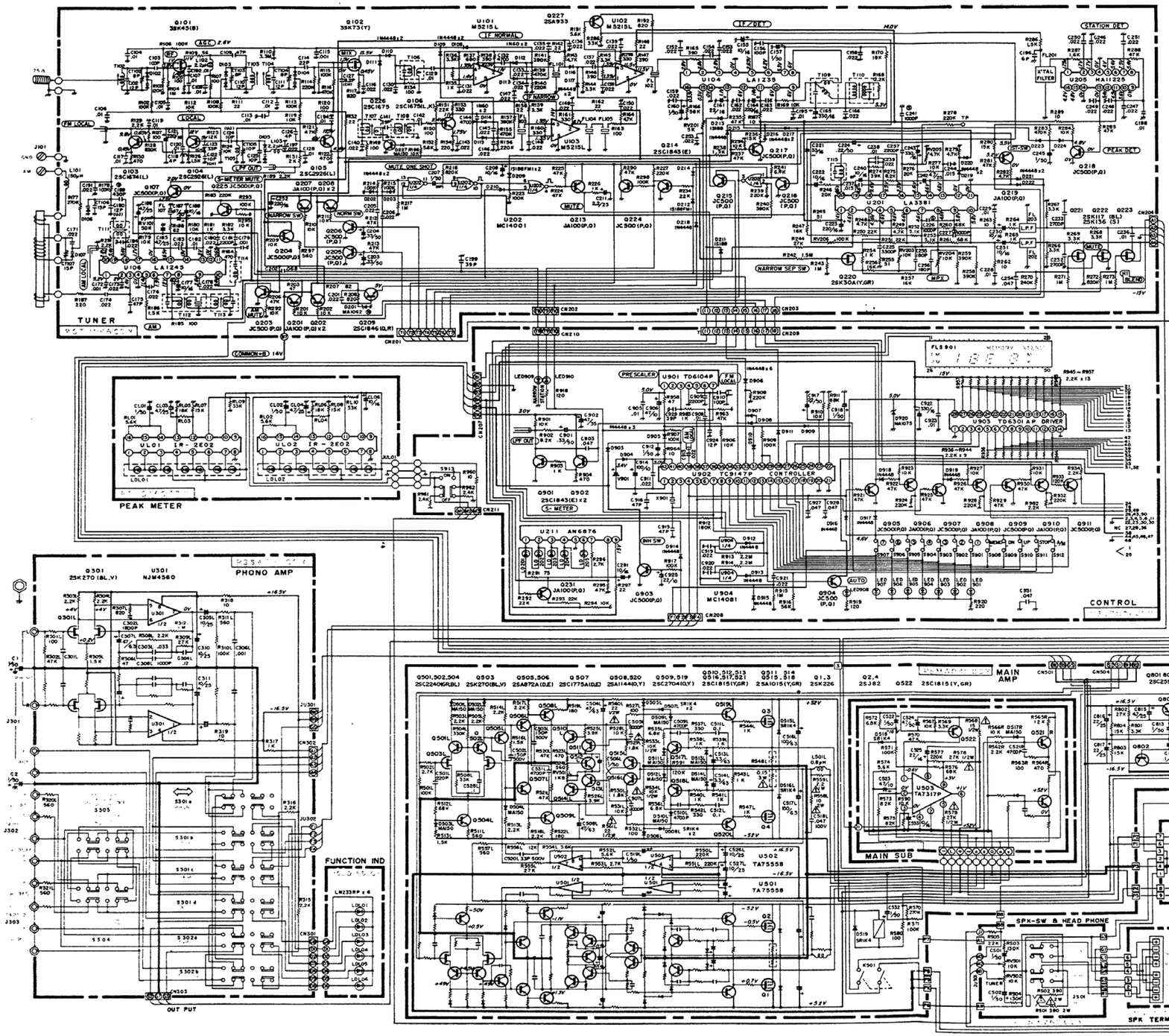

PSTU066COX
PSMA049COX
PSPT018COX
PSW260COX
PSLD160COX
PSCZ024COX
CONTROLLER U902 TC9147P
PRE SCALER U901 TD6104P
PLL-LPF Q901 Q902 2SC1843
S-METER DRIVER U211 AN6876
SIGNAL DET Q231 JA100
DATA LATCH AND FL DRIVER U901 TD6301A
DRIVER MEMORY Q909 Q910 JC500 JA100
MEMORY STEREO
FM AM 189.9 MHz KHz
FM MPX U201 LA3381
AM RF MIX AND IF U106 LA1245
FM IF AMP U103 M52151L
FM RF AMP Q101 2SK62
FM OSC OSC Q104 2SC1674
FM IF AMP Q106 2SC1675
AM AGC MUTE Q107 JC500
AM S-METER MUTE Q225 JC500
AM AF MUTE Q203 JC500
AM LOCAL OSC
AM BAR ANT
+5V REGULATOR Q209 2SC1864
NORM +B SW Q206 Q208 JC500 JC300
NARROW LED DRIVE Q204 JC500
NORM +B SW Q205 Q207 JC500 JA100
MUTE ONE SHOT U202 1/4 1/4
MUTE OR GATE DRIVE U202 Q213 1/4 JA100
FM +B SW Q202 JA100
AM +B SW Q201 JA100
NARROW SW Q220 2SK30A
ST MONO SW Q219 JA100
L.P.F FL203
L.P.F FL204
AF MUTE Q222 2SK136
HI BLEND Q223 2SK117
AUTO MUTE SW Q215 JC500
STATION AMD Q216 JC500
PEAK DET Q218 JC500
STATION DET U205 HA1122
X'TAL FILTER 10.7MHz FL201
CF 10.7MHz FL103
CF 10.7MHz FL104
CF 10.7MHz FL105
AGC DET Q114 D115
INV Q241 2SC1843
INV U203 1/4
DRIVER STEREO Q311 JC500
DRIVER-SW AM KHz Q907 Q908 JC500 JA100
DRIVER-SW FM MHz Q905 Q906 JC500 JA100
P-METER DRIVER UL01 IR-2E02
P-METER DRIVER UL02 IR-2E02
P-METER SENS MECH SW S913
INH SW Q903 JC500
AUTO LED DRIVER Q904 JC500
AUTO MANU ONE SHOT U901
S901~S912 TUNER FUNCTION SW
1~7 LED
FL HEATER
FROM PSMA049COX
FROM PSPT018COX
TO PSW260COX

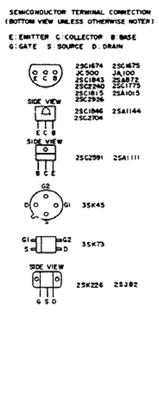

PSVR025COX
PSPT018COX
PSSW261COX
PSLD166COX
PSPW063COX
PSMA049COX
PSPW064COX
PHONO (MM) AMP Q301,U501
FUNCTION MECH SW LCH RCH S301,S302
TAPE COPY MECH SW LCH RCH S303,S304
FUNCTION LED
MODE SW ST-MONO S402B
AUDIO MUTE MECH SW SV01
BALANCE VR405 VRV01
LOUDNESS MECH SW S402A
SUB SONIC FITTER MECH SW S401B
FLAT AMP U40 NJM4559
TONE AMP U401 Q401~404
TONE VR401~404
TONE ON/OFF MECH SW S401A
HI FIL MECH SW S401C
MUTE H/L SW S401D
IF BAND SW S401E
HI-BLEND SW S401F
SERVO AMP U501 NJM4558
POWER AMP Q501~Q520 Q3 Q4 Q1 Q2 LCH RCH
PROTECTER Q521(L,R) Q522 U503
RELAY K501
SP SELECT SW S5010 S5016
SP TERMINAL JZ01
HEAD PHONE JS01
P-METER ADJ
REGULATOR Q803
REGULATOR Q804 REF
REGULATOR Q801 Q802 U801
RECTIFIER Q801
REGULATOR Q805
RECTIFIER S10 VB20 Q801
POW OFF MUTE
FUSE
AC120V 60Hz
TUNER LCH
LCH COMMON
RCH COMMON
TO PSTU066COX
TO PSCZ024COX

Schematic Diagram



SEMICONDUCTOR TERMINAL CONNECTION
(BOTTOM VIEW UNLESS OTHERWISE NOTED)

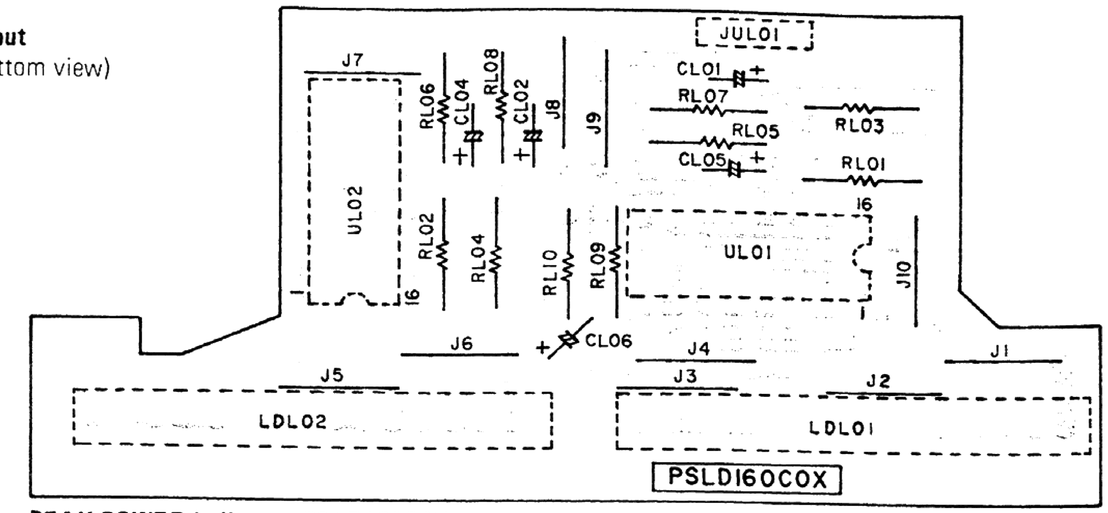
E: EMITTER C: COLLECTOR B: BASE
G: GATE S: SOURCE D: DRAIN



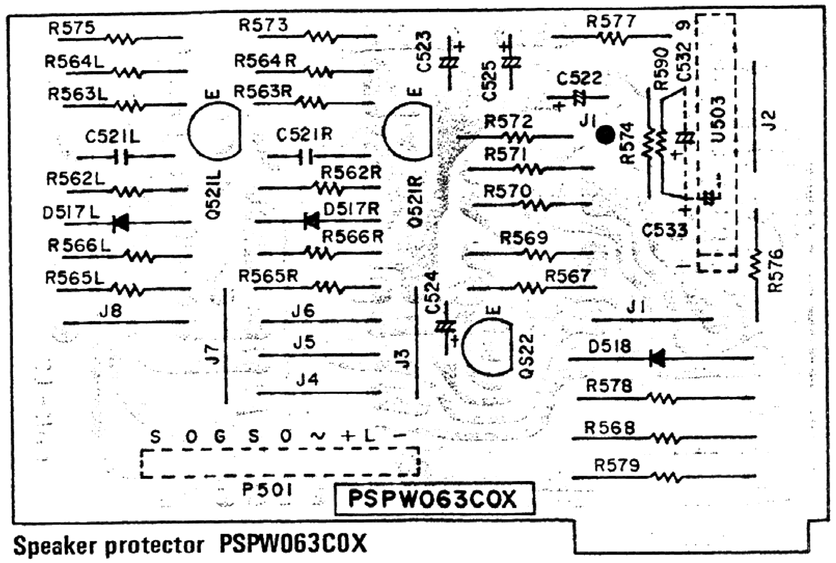
Note

All resistors are 1/4 watt unless otherwise noted.
Resistor values are in ohm(1k=1,000 ohm).
All capacitor values are in micro-farad(p=pico-farad).
All voltages, read from chassis, are measured with VTVM under no signal conditions unless otherwise noted.
+ B power supply line.
— — B power supply line.
Symbol numbers with suffix L(e.g. Q101L) refer to components for the left channel; symbol numbers with suffix R(e.g. Q101R) refer to components for the right channel.
Safety precautions to service personnel
(1) ⚠ Safety requirement components in accordance with present safety regulations. These components must only be replaced by original components.
(2) To comply with present safety regulations, be sure to make leakage-current or resistance measurements before returning the appliance to customer.

PC Board Layout
(All boards bottom view)

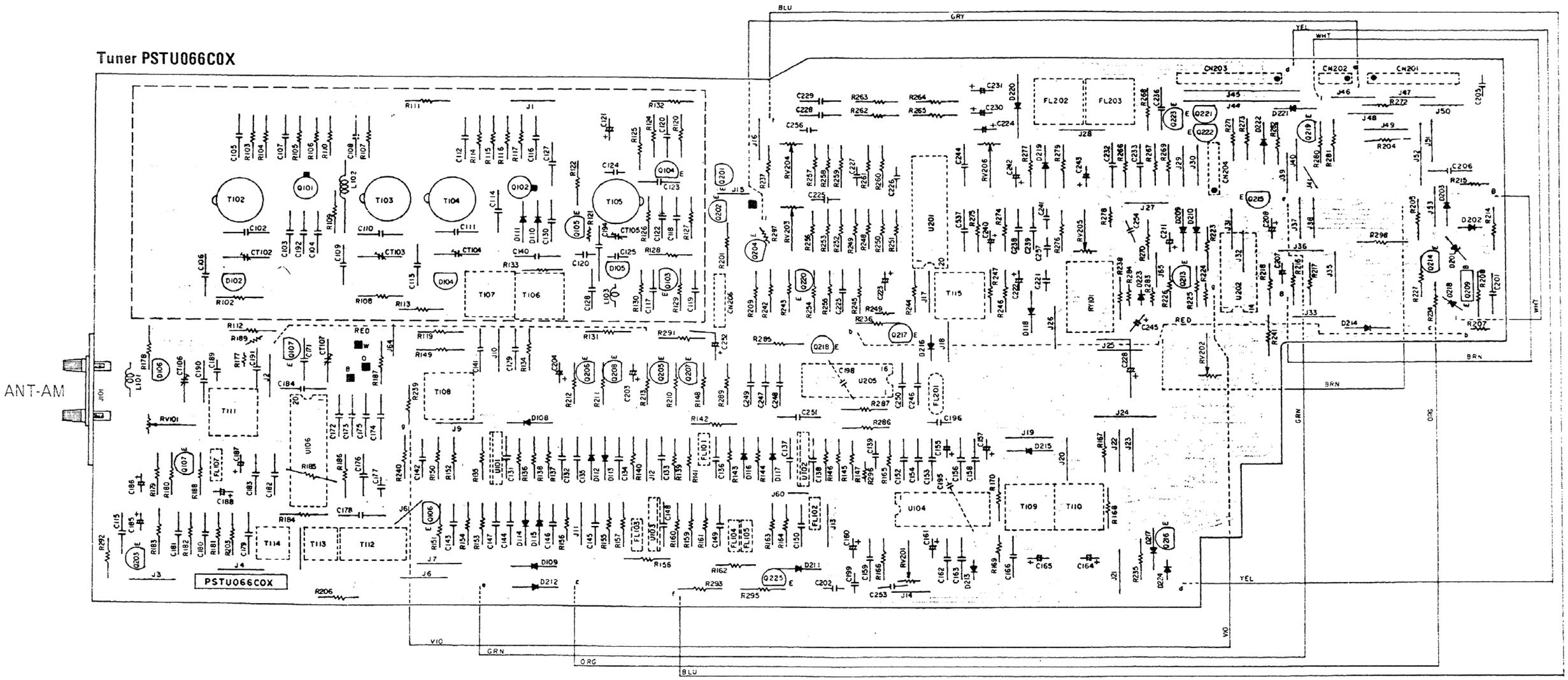


PEAK POWER indicator **PSLD160C0X**

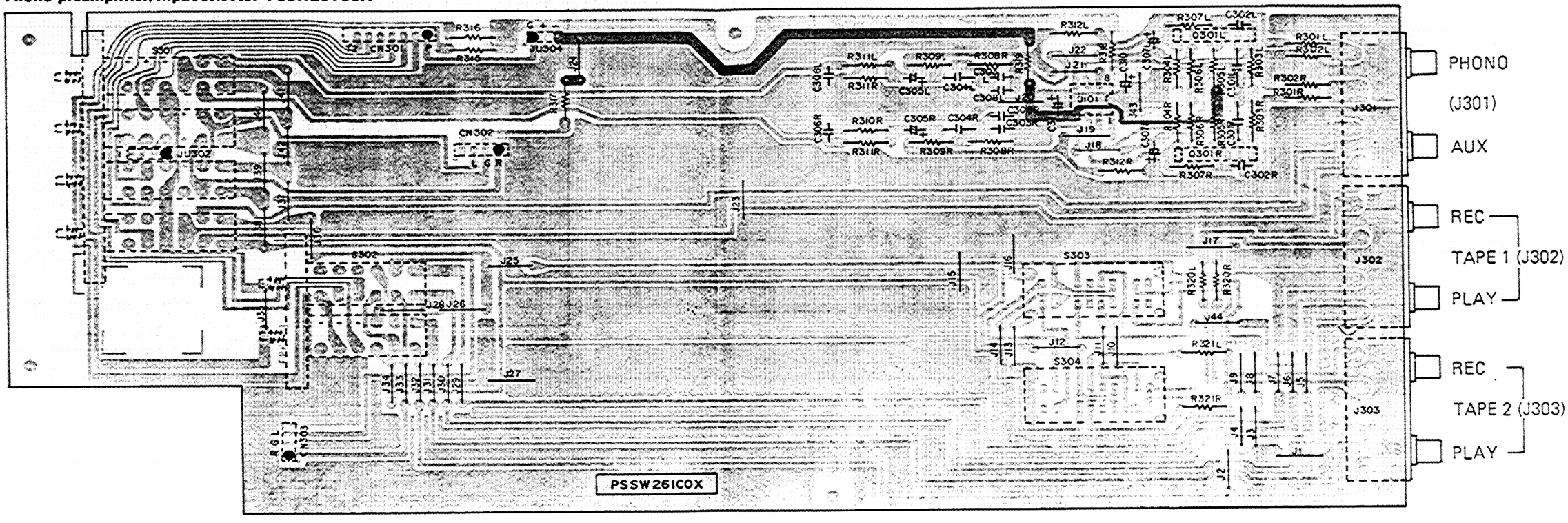


Speaker protector **PSPW063C0X**

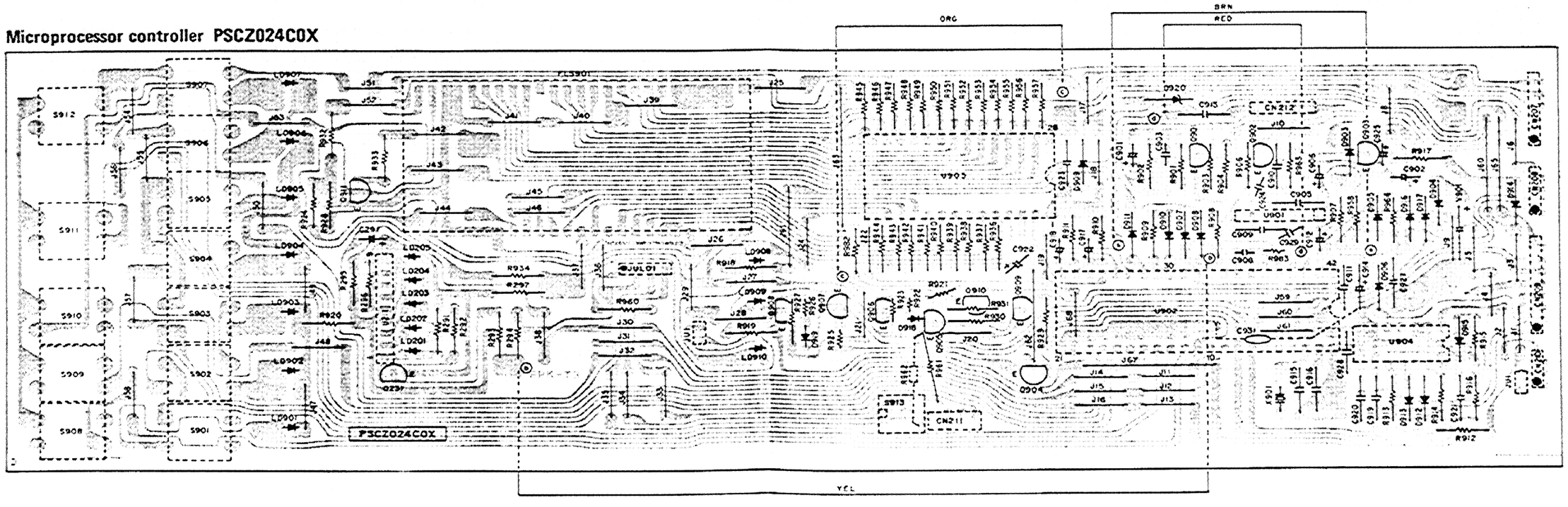
Tuner **PSTU066C0X**



Phono preamplifier/Input selector PSSW261C0X

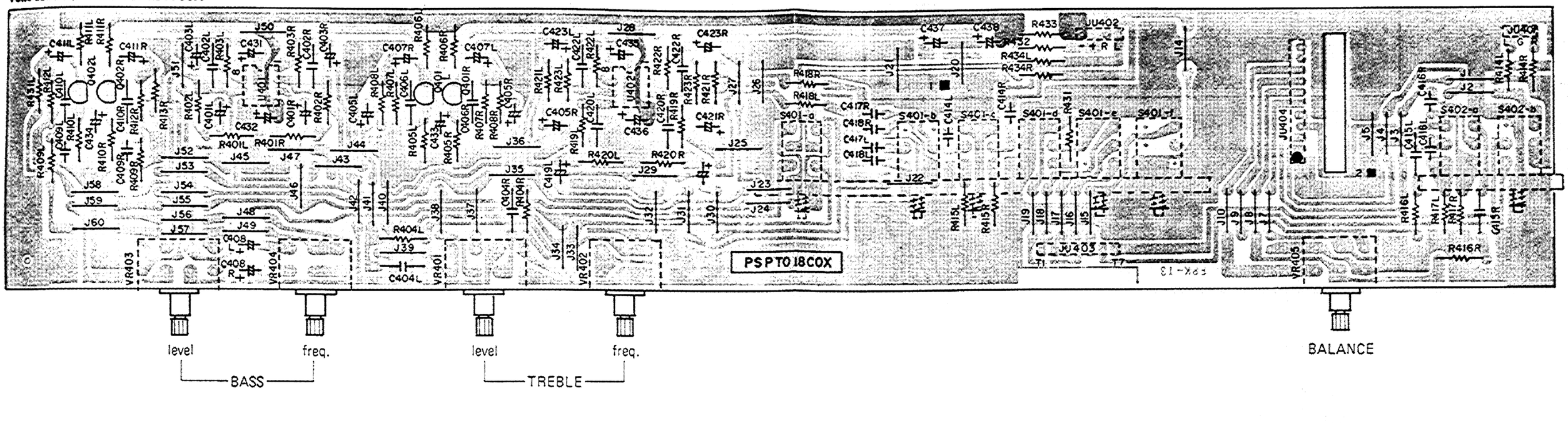


Microprocessor controller PSCZ024C0X

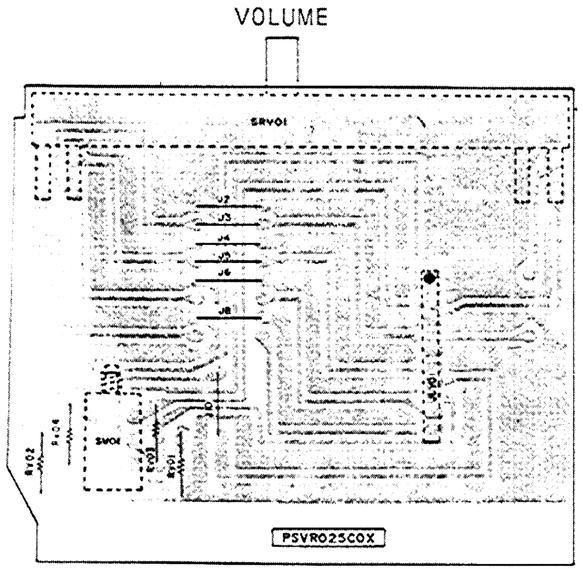


All PC boards bottom view.

Tone control/Filters PSPT018C0X

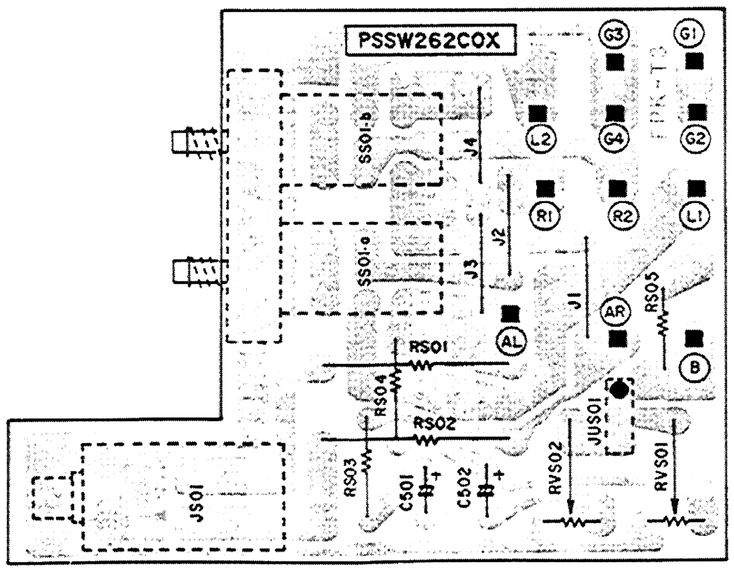


VOLUME/MUTE PSVR025C0X

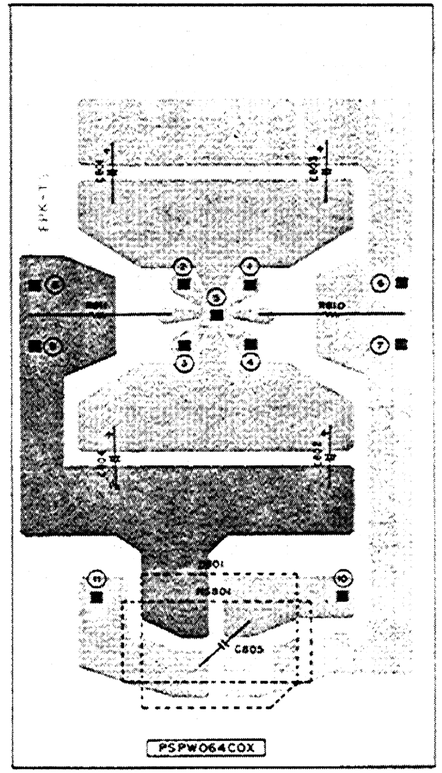


All PC boards bottom view.

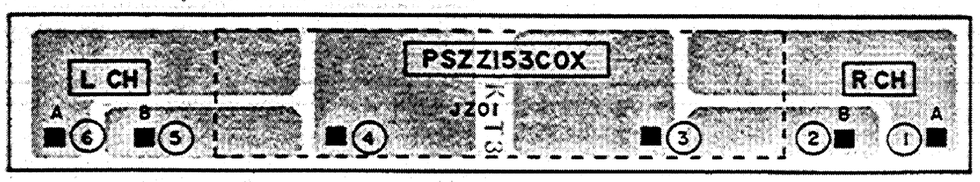
SPEAKERS A/B switch PSSW262C0X



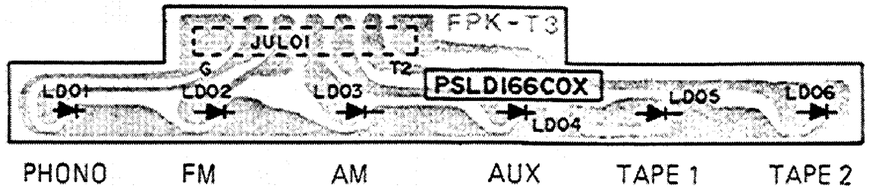
Rectifier PSPW064C0X



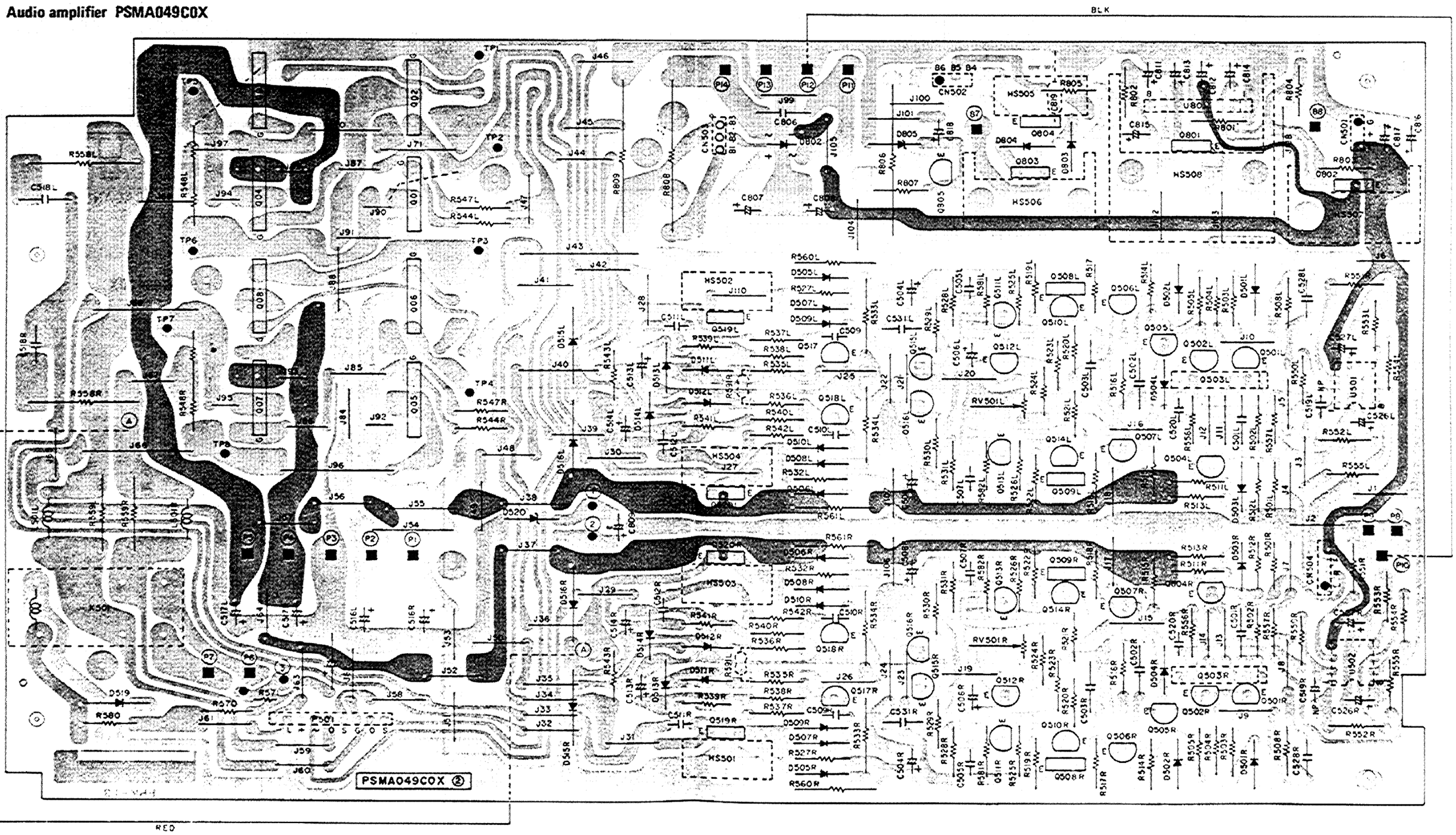
SPEAKERS output terminal PSZZ153C0X



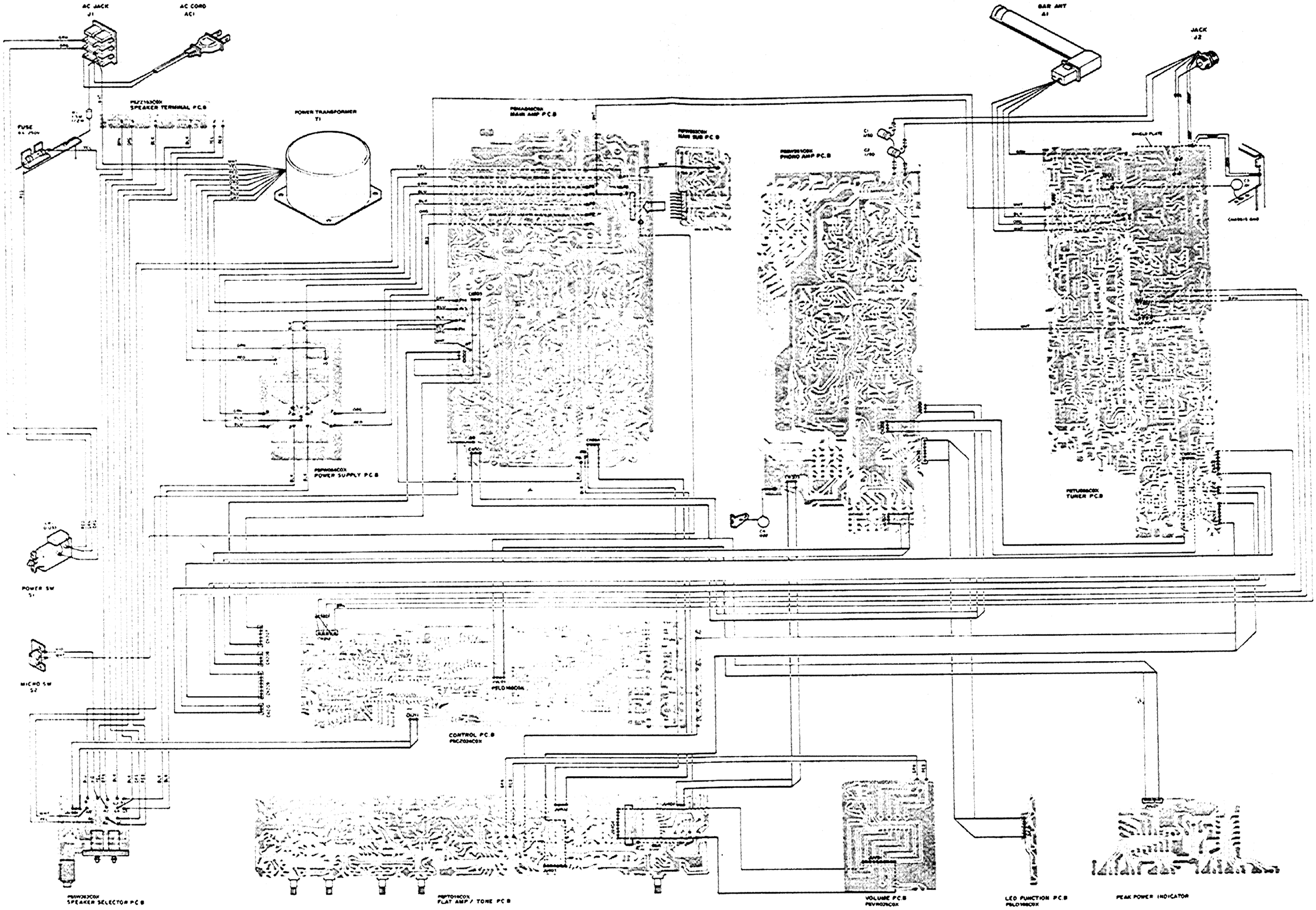
Input selection indicators PSLD166C0X



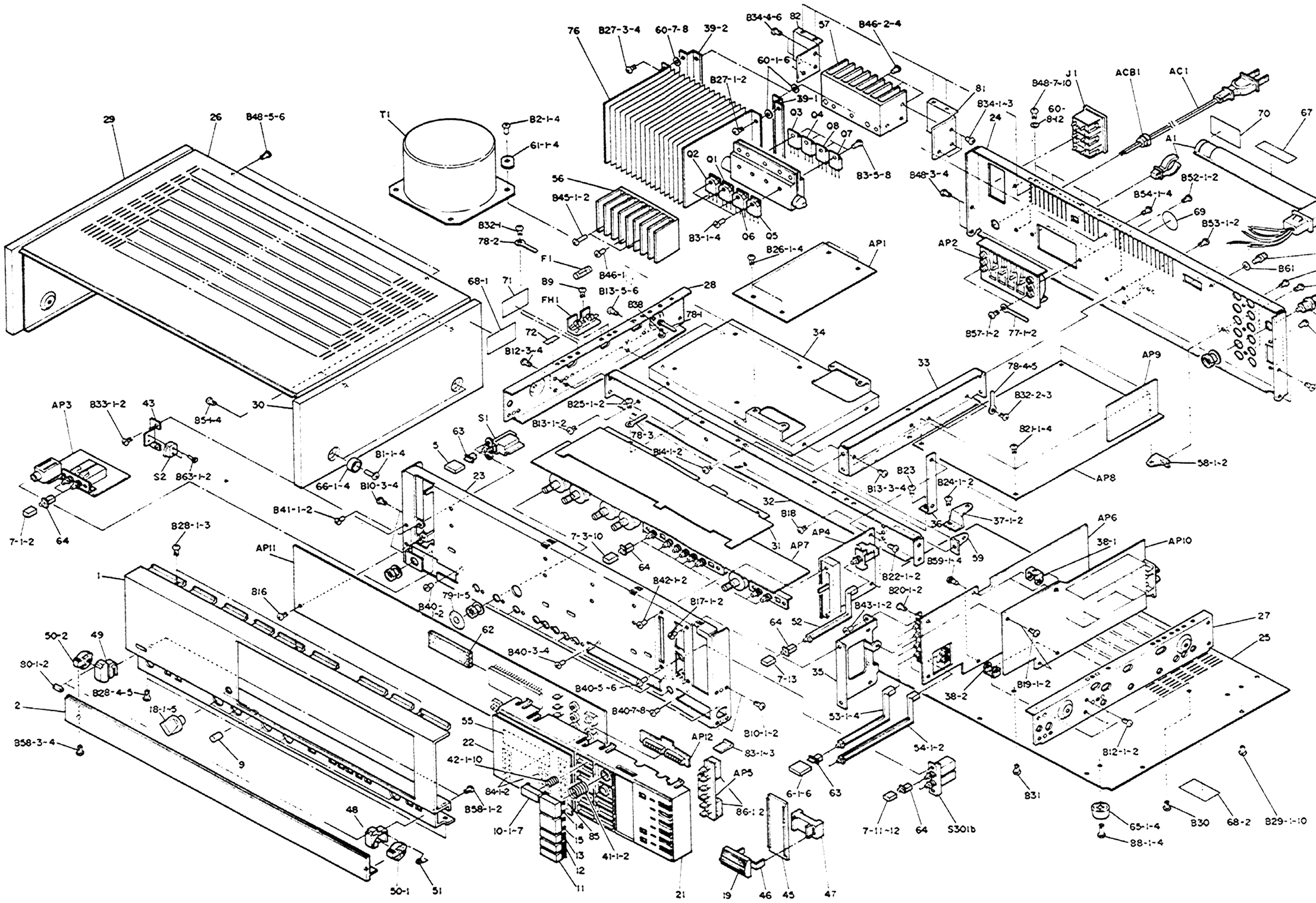
Audio amplifier PSMA049C0X



Wiring Diagram



Exploded View



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Part List

ASSEMBLY CODE	ASSEMBLY NAME
RAC24AVCALJ	ELEC. ELEMENTS

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
ACB1		⚠ VM270N8001	BUSHING	
AC1		⚠ ACAC029ULA	AC CORD ASSY.	
A1		TEAR120E09	BAR ANTENNA	
CN1		ACCN805ULA	CONN. CORD ASSY	
CN2		ACCN830ULA	CONN. CORD ASSY	
CN3		ACCN831ULA	CONN. CORD ASSY	
CN4		ACCN832ULA	CONN. CORD ASSY	
CN5		ACCN833ULA	CONN. CORD ASSY	
CN6		ACCN836ULA	CONN. CORD ASSY	
CR1		⚠ CRA333A01N	C-R MODULE	
FH1		⚠ YHF1P3004U	FUSE HOLDER	
F1		⚠ ZF8Q60203U	FUSE	
J1		⚠ YJA06D001U	AC JACK	
J2		YJC01S002Z	F CONNECTOR	
J3		YTD01S002U	TERMINAL	
Q1		QTK0226XAB	TRANSISTOR	2SK226
Q2		QTJ0082XAB	TRANSISTOR	2SJ82
Q3		QTK0226XAB	TRANSISTOR	2SK226
Q4		QTJ0082XAB	TRANSISTOR	2SJ82
S1		⚠ SP01AAU17N	PUSH SWITCH	
S2		SM010218ZR	MICRO SWITCH	
S303B		SP02A1X01A	PUSH SWITCH	
S303C	S304C	SWP216X01A	REMO-CON. WIRE	
T1		⚠ TPZ80U002M	PWR.TRANSFORMER	

⚠ Safety requirement conponents in accordance with present safety regulations.
These components must only be replaced by original components.

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ASSEMBLY CODE	ASSEMBLY NAME
RAC24AVCA12	MECH. ELEMENTS

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
B-9		BTPW3010BZ	BRAS. TAP SCREW	+ BIT, M3 X 10 S-ZNCR
B1-1	B1-2	BSPB5025N8	BIND HD SCREW	+ BIT, M5 X 25 S-BLACK
B1-3	B1-4			
B10-1	B10-2	BTPW3008BZ	BRAS. TAP SCREW	+ BIT, M3 X 8 S-ZNCR
B10-3	B10-4			
B12-1	B12-2			
B12-3	B12-4			
B13-1	B13-2			
B13-3	B13-4			
B13-5	B13-6			
B14-1	B14-2			
B16	B17-1			
B17-2	B18			
B19-1	B19-2			
B2-1	B2-2	BTP84010TZ	BIND TAP SCREW	+ BIT, M4 X 10 S-ZNCR TAP TITE
B2-3	B2-4			
B20-1	B20-2	BTPW3008BZ	BRAS. TAP SCREW	+ BIT, M3 X 8 S-ZNCR
B21-1	B21-2			
B21-3	B21-4			
B22-1	B22-2			
B23	B24-1			
B24-2	B25-1			
B25-2	B26-1			
B26-2	B26-3			
B26-4	B27-1			
B27-2	B27-3			
B27-4	B28-1			
B28-2	B28-3			
B28-4	B28-5			
B29-1	B29-10			
B29-2	B29-3			
B29-4	B29-5			
B29-6	B29-7			
B29-8	B29-9			
B3-1	B3-2	BSPB3006NN	BIND HEAD SCREW	+ BIT, M3 X 6 S-NI
B3-3	B3-4			
B3-5	B3-6			
B3-7	B3-8			
B30	B31	BTPW3008BZ	BRAS. TAP SCREW	+ BIT, M3 X 8 S-ZNCR
B32-1	B32-2			
B32-3	B33-1			
B33-2				
B34-1	B34-2	BTPW3008AZ	BRAS. TAP SCREW	+ BIT, M3 X 8 S-ZNCR
B34-3	B34-4			
B34-5	B34-6			
B38		BTPW3008BJ	BRAS. TAP SCREW	+ BIT, M3 X 8 S-SN
B40-1	B40-2	BSPC3005NZ	CEMS SCREW	+ BIT, M3 X 5 S-ZNCR
B40-3	B40-4			
B40-5	B40-6			
B40-7	B40-8			

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ASSEMBLY CODE	ASSEMBLY NAME
RAC24AVCAL2	MECH. ELEMENTS

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
B41-1	B41-2	BSPC3005NZ	CEMS SCREW	+ BIT, M3 X 5 S-ZNCR
B42-1	B42-2			
B43-1	B43-2			
B45-1	B45-2	BSPP3016NN	PAN HEAD SCREW	+ BIT, M3 X 16 S-NI
B46-1	B46-2	BSPP3010NN	PAN HEAD SCREW	+ BIT, M3 X 10 S-NI
B46-3	B46-4			
B48-1	B48-10	BTPL3008B8	NAIL TAP SCREW	+ BIT, M3 X 8 S-BLACK
B48-2	B48-3			
B48-4	B48-5			
B48-6	B48-7			
B48-8	B48-9			
B49-1	B49-2	BTPB3008B8	BIND TAP SCREW	+ BIT, M3 X 8 S-BLACK
B49-3	B49-4			
B5-1	B5-2	BTPW3012A8	BRAS TAP SCREW	+ BIT, M3 X 12 S-BLACK
B5-3	B5-4			
B50-1	B50-2	BTPB3008A8	BIND TAP SCREW	+ BIT, M3 X 8 S-BLACK
B50-3	B51-1			
B51-2	B52-1			
B52-2				
B53-1	B53-2	BTPB3008B8	BIND TAP SCREW	+ BIT, M3 X 8 S-BLACK
B54-1	B54-2			
B54-3	B54-4			
B56-1	B56-2	BTPB3006B8	BIND TAP SCREW	+ BIT, M3 X 6 S-BLACK
B57-1	B57-2	BTPP3006AZ	PAN TAP SCREW	+ BIT, M3 X 6 S-ZNCR
B58-1	B58-2	BTPP3008A8	PAN TAP SCREW	+ BIT, M3 X 8 S-BLACK
B58-3	B58-4			
B59-1	B59-2	BRP3045QNB	PAN HEAD RIVET	3 X 45 PLASTIC
B59-3	B59-4			
B61		BWM30A08SN	FLAT L. WASHER	FLAT LARGE, 3 M/M S-NI
B63-1	B63-2	BSMH1208NS	FLAT FLAT SCREW	- BIT, M1.2 X 8 BS-NI
B8-1	B8-2	BTPW3010BZ	BRAS. TAP SCREW	+ BIT, M3 X 10 S-ZNCR
B8-3	B8-4			
SL104		MS635SS003	SHEILD F	
1		AMR651U*01	*ESCUTCHEON ASSY	
10-1	10-2	VN230SM022	BUTTON W	
10-3	10-4			
10-5	10-6			
10-7				
11		VN230SM003	BUTTON A	
12		VN230SM004	BUTTON B	
13		VN230SM005	BUTTON C	
14		VN230SM014	BUTTON L	
15		VN230SM015	BUTTON M	
18-1	18-2	VN276SM052	VR KNOB	
18-3	18-4			
18-5				
19		VN130SM002	VR KNOB	
2		ME94EAA001	DOOR PLATE	
21		VE86JSM031	FRAME	
22		VS768AK002	PLATE INDICATOR	

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ASSEMBLY CODE	ASSEMBLY NAME
RAC24AVCAL2	MECH. ELEMENTS

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
23		MB972SX003	FRONT PANEL	
24		MB972SX005	REAR PANEL	
25		MS986SX025	BOTTOM PLATE	
26		MU897SM017	COVER	
27		MU851SX003	SIDE BRACKET	
28		MU851SX004	SIDE BRACKET	
29		AMR651U*11	*SIDE PIECE ASSY	
30		AMR651U*12	*SIDE PIECE ASSY	
31		MZ861SS001	SHIELD	
32		MB931SX001	CENTER BRK A	
33		MB831SX003	CENTER BRK B	
34		MB772SX003	TRANS BRACKET	
35		ML661SX001	PCB BRACKET A	
36		ML162SX001	PCB BRACKET B	
37-1	37-2	MZ222SX002	PCB BRACKET C	
38-1	38-2	MU121SX002	PCB BRACKET D	
39-1	39-2	MZ621SX001	HEAT BRACKET	
41-1	41-2	MW371LY001	SPRING BUTTON L	
42-1	42-10	MW361LY001	SPRING BUTTON S	
42-2	42-3			
42-4	42-5			
42-6	42-7			
42-8	42-9			
43		ML421SS001	SW BRACKET	
45		VS648SM004	KNOB COVER	
46		MU422SE001	KNOB PLATE	
47		VQ422SN001	VR JOINT	
48		VK432SM001	DOOR BEARING R	
49		VK432SM002	DOOR BEARING L	
5		VN220SP016	BUTTON POWER	
50-1	50-2	VM283SB003	DOOR PULLEY	
51		MW356LY001	SPRING	
52		VQ611SB003	SHAFT-A	
53-1	53-2	VQ611SB004	SHAFT-B	
53-3	53-4			
54-1	54-2	VQ611SB005	SHAFT-C	
55		VS635AS002	PLATE FL	
56		MH644AD001	HEAT SINK	
57		MH644AD002	HEAT SINK R	
58-1	58-2	ML221SX003	PCB BRACKET	
59		ML321SX001	PCB BRACKET	
6-1	6-2	VN220SM006	BUTTON SELECT	
6-3	6-4			
6-5	6-6			
60-1	60-10	VS607FN001	WASHER	
60-11	60-12			
60-2	60-3			
60-4	60-5			
60-6	60-7			
60-8	60-9			

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ASSEMBLY CODE	ASSEMBLY NAME
RAC24AVCAL2	MECH. ELEMENTS

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
61-1	61-2	MS317SZ006	PLATE	
61-3	61-4			
63		VN220SN001	BUTTON SPACER M	
64-1	64-2	VN120SN002	BUTTON SPACER	
65-1	65-2	VM283SB004	FOOT	
65-3	65-4			
7-1	7-10	VN120SM002	PUSH BUTTON A	
7-11	7-12			
7-13	7-2			
7-3	7-4			
7-5	7-6			
7-7	7-8			
7-9				
76		AVH-P1P002	*HEAT PIPE ASSY	
77-1	77-2	MX315SZ001	CLAMPER	
78-1	78-2	MX415SZ001	CLAMPER	
78-3	78-4			
78-5				
79-1	79-2	VS806YB004	SHEET	
79-3	79-4			
79-5				
80-1	80-2	VS217RB002	SHEET	
81		MZ432SX001	HEAT BRACKET L	
82		MZ432SX002	HEAT BRACKET R	
83-1	83-2	ML121SL001	L ANGLE	
83-3				
86-1	86-2	VQ421RF002	SPONGE PCB	
87		VM160SN001	SPACER	
9		MN165AA001	BUTTON	

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ASSEMBLY CODE	ASSEMBLY NAME	DESCRIPTION AND SPECIFICATIONS
**********		Accessories

SYMBOLIC OR EXPLODED VIEW NO.	PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
	KTR651U*BX	Operation MANUAL	Revised version
	KZ000049AX	Safety Instruction	Instructions regarding safety
	KPR651U*01	Carton	
	AXDP002GEA	Conversion adapt.	Antenna matching (75 ohm-300 ohm)
	ZAT0015002	Twin lead antenna	Convenience antenna

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ASSEMBLY CODE	ASSEMBLY NAME
APSCZ024BD	P.W.BOARD ASSY.

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
		MW401CX001	SHORT JUMPER	JW-10
		MW401CX006	SHRT JUMPER	10MM
		MW401CX008	SHORT JUMPER	
		MW401CX009	SHORT JUMPER	
		MW401CX010	SHORT JUMPER	
		MW401CX012	SHORT JUMPER	
		PSCZ024C0X	PRINTED W.BOARD	
CN207		YJF06S035Z	JUNCTION JACK	B6B-XH
CN208		YJF04S043Z	JUNCTION JACK	B4B-XH
CN209		YJF08S028Z	JUNCTION JACK	B8B-XH
CN210	CN211	YJF03S042Z	JUNCTION JACK	B3B-XH-A
CN212		YJF05S021Z	JUNCTION JACK	B5B-XH
C911	C913	CKV1223N2Y	CERAMIC CAP.	.022,16V,Y,+30% AXIAC-TYPE
C919	C920			
C921	C927			
C928				
D903	D904	QDSMA150XN	SILICON DIODE	MA150 VF 1.2V,VR 35V NO-RANK 24MIN
D905	D906			
D907	D908			
D909	D910			
D911	D912			
D913	D914			
D915	D916			
D917	D918			
D919				
D920		QDZA1075MN	ZENER DIODE	MA1075M
FLS901		ZLFG77F2G8	DISPLAY TUBE	FG77F2GR
LD201	LD202	QLBLN317GN	L.E.D.	LN317GP GREEN
LD203	LD204			
LD205				
LD901	LD902	QLBLN217RN	L.E.D.	LN217RP RED
LD903	LD904			
LD905	LD906			
LD907				
LD908	LD909	QLBLN317GN	L.E.D.	LN317GP GREEN
LD910				
Q231		QTAJA100BQ	TRANSISTOR	JA100 P.Q-RANK PC 300MW, FT 50 MHZ
Q901	Q902	QTC1843XBA	TRANSISTOR	2SC1843 E-RANK PC 250MW, FT 110MHZ
Q903	Q904	QTCJC500BQ	TRANSISTOR	JC500 P.Q-RANK PC 300MW, FT 100MHZ
Q905				
Q906		QTAJA100BQ	TRANSISTOR	JA100 P.Q-RANK PC 300MW, FT 50 MHZ
Q907		QTCJC500BQ	TRANSISTOR	JC500 P.Q-RANK PC 300MW, FT 100MHZ
Q908		QTAJA100BQ	TRANSISTOR	JA100 P.Q-RANK PC 300MW, FT 50 MHZ
Q909		QTCJC500BQ	TRANSISTOR	JC500 P.Q-RANK PC 300MW, FT 100MHZ
Q910		QTAJA100BQ	TRANSISTOR	JA100 P.Q-RANK PC 300MW, FT 50 MHZ
Q911		QTCJC500BQ	TRANSISTOR	JC500 P.Q-RANK PC 300MW, FT 100MHZ
S901	S902	SK0101X05A	KEY SWITCH	KHC10902
S903	S904			
S905	S906			
S907	S908			

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ASSEMBLY CODE	ASSEMBLY NAME
APSCZ024BD	P.W.BOARD ASSY.

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
S909	S910	SK0101X05A	KEY SWITCH	KHC10902
S911	S912			
S913		SP01AAX68A	PUSH SWITCH	
U211		QQM06876AN	I.C.	AN6876
U901		QQM06104AT	I.C.	TD6301P
U902		QQ009147AT	I.C.	TC9147P
U903		QQM06301AT	I.C.	TD6301AP
U904		QQ004081FN	I.C.	MN4081B
V901		ZBL030104S	BATTERY	CR2430
X901		XAS1A4007X	XTAL OSCILLATOR	7.20MHZ
S2		VQ521RB002	SPACER	
B4-1	B4-2	VS315CF001	LED GUIDE C	
B5		VS615CN003	LED GUIDE B	

ASSEMBLY CODE	ASSEMBLY NAME	DESCRIPTION AND SPECIFICATIONS
APSLD160BD	P.W.BOARD ASSY.	

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
		PSLD160C0X	PRINTED W.BOARD	
JUL01		ACRW037ULA	RIBBON WIRE	
LDL01	LDL02	QLA107N123	L.E.D.	GL-107N12
UL01	UL02	QQMR2E02A3	I.C.	IR-2E02

ASSEMBLY CODE	ASSEMBLY NAME	DESCRIPTION AND SPECIFICATIONS
APSLD166AA	P.W.BOARD ASSY.	

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
		PSLD166C0X	PRINTED W.BOARD	
JUL01		ACCN835ULA	CONN. CORD ASSY	
LDL01	LDL02	QL8LN233RN	L.E.D.	LN233RP RED
LDL03	LDL04			
LDL05	LDL06			

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ASSEMBLY CODE	ASSEMBLY NAME
APSMA049BD	P.W.BOARD ASSY.

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
		MW201BS001	TERMINAL	
		MW401CX002	SHORT JUMPER	
		MW401CX003	SHORT JUMPER	
		MW401CX004	SHORT JUMPER	JW-5
		MW401CX005	SHORT JAMPER	JW-15
		MW401CX006	SHRT JUMPER	10MM
		MW401CX008	SHORT JUMPER	
		MW401CX009	SHORT JUMPER	
		PSMA049C0X	PRINTED W.BOARD	
B501-1	B501-2	BTPB3008WZ	BIND B-TYTE SRW	+ BIT B-TYTE M3X8 S-ZNCR BIND
B501-3	B501-4			
B501-5				
B502-1	B502-2	BSPB3008NN	BIND HEAD SCREW	+ BIT, M3 X 8 S-NI
B502-3				
CN501	CN502	YJF03S042Z	JUNCTION JACK	B3B-XH-A
CN503				
CN504		YJF04S043Z	JUNCTION JACK	B4B-XH
C502L	C502R	CCDE151K0M	CERAMIC CAP.	150PF 500V -10, +10% SL
C503L	C503R			
C518L	C518R	CQMC473JEH	MYLAR CAPACITOR	.047UF 100V 5%
C520L	C520R	CCDE330K0M	CERAMIC CAP.	SL 33PF 500V -10, +10%
C806		CKDE103PEM	CERAMIC CAP.	0.01MFD 500V -0, +100% E
D501L	D501R	QDSMA150XN	SILICON DIODE	MA150 VF 1.2V,VR 35V NO-RANK 24MIN
D502L	D502R			
D503L	D503R			
D504L	D504R			
D505L	D505R	QDSSR1KX4P	SILICON DIODE	SR1K-4 VR 200 4-RANK 25MIN
D506L	D506R			
D507L	D507R			
D508L	D508R			
D509L	D509R	QDSMA150XN	SILICON DIODE	MA150 VF 1.2V,VR 35V NO-RANK 24MIN
D510L	D510R			
D511L	D511R			
D512L	D512R			
D513L	D513R			
D514L	D514R			
D515L	D515R	QDSSR1KX4P	SILICON DIODE	SR1K-4 VR 200 4-RANK 25MIN
D516L	D516R			
D519				
D802		QDS1D481XT	SILICON DIODE	1D481 1.2V NO-RANK 19MIN
D803	D804	QDSMA150XN	SILICON DIODE	MA150 VF 1.2V,VR 35V NO-RANK 24MIN
D805		QDZA1300MN	ZENER DIODE	MA1300M
HS501	HS502	MU242A0004	HEAT SINK	
HS503	HS504			
HS505				
HS506	HS507	MH332AA001	HEAT SINK	IC2435-ST
HS508		MH433AA001	HEAT SINK	IC3030-ST
K501		ZRA272101Z	RELAY	JC2A-48V
L501L	L501R	LA3QH1015B	CHOKE COIL	
P1	P2	MX436SS001	TERMINAL	

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ASSEMBLY CODE	ASSEMBLY NAME
APSPT018AD	P.W.BOARD ASSY.

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
		MW2018S003	TERMINAL	
		MW401CX006	SHRT JUMPER	10MM
		PSPT018C0X	PRINTED W.BOARD	
		PSR651*1CX	PRINTED W.BOARD	
JU401		ACCN837ULA	CONN. CORD ASSY	
JU402		ACCN838ULA	CONN. CORD ASSY	
JU403		ACCN839ULA	CONN. CORD ASSY	
Q401L	Q401R	QTC2240XAT	TRANSISTOR	2SC2240 GR,BL PC 300MW, FT 100MHZ
Q402L	Q402R			
S401		SP06BAX03A	PUSH SWITCH	
S402		SP02BAX06A	PUSH SWITCH	
U401		QQM04558BU	I.C.	4558 TI
U402		QQM04559AJ	I.C.	NJM4559D-A NOSELECTOPERATIONAL AMP.
VR401		RVQA104B08	VR.	
VR402		RVQA104C01	VR.	
VR403		RVQA104B08	VR.	
VR404		RVQA104C01	VR.	
VR405		RVQA104X01	VR.	

ASSEMBLY CODE	ASSEMBLY NAME	DESCRIPTION AND SPECIFICATIONS
APSPW063AD	P.W.BOARD ASSY.	

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
		MW401CX006	SHRT JUMPER	10MM
		PSPW063C0X	PRINTED W.BOARD	
D517L	D517R	QDSMA150XN	SILICON DIODE	MA150 VF 1.2V,VR 35V NO-RANK 24MIN
D518		QDSSR1KX4P	SILICON DIODE	SR1K-4 VR 200 4-RANK 25MIN
P501		YJF09S036Z	JUNCTION JACK	3094-09A
Q521L	Q521R	QTC1815XAT	TRANSISTOR	2SC1815 Y,GR PC 400MW, FT 80MHZ
Q522		QTA1015XAT	TRANSISTOR	2SA1015 Y,GR PC 400MW, FT 80MHZ
R568		RGHARJ150B	M-OXIDE FILM R.	1/2W 15-OHM
R578	R579	RGHARJ273B	M-OXIDE FILM R.	1/2W 27K-OHM
U503		QQM07317AT	I.C.	TA7317P

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ASSEMBLY CODE	ASSEMBLY NAME
APSPW064BA	P.W.BOARD ASSY.

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
		MW201BS001	TERMINAL	
		PSPW064C0X	PRINTED W.BOARD	
B801		BSPB3010NN	BIND HEAD SCREW	+ BIT, M3 X 10 S-NI
C801	C802	CET1Y68201	ELYT. CAPACITOR	
C803	C804			
C805		CKDE103PEM	CERAMIC CAP.	0.01MFD 500V -0, +100% E
D801		QDS10V820K	SILICON DIODE	S10VS20
HS801		MH322AA003	HEAT SINK	
R810	R811	RG2ARJ222B	M-OXIDE FILM R.	2W 2.2K OHM 5%

ASSEMBLY CODE	ASSEMBLY NAME	DESCRIPTION AND SPECIFICATIONS
APSSW261AD	P.W.BOARD ASSY.	

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
		MW401CX006	SHRT JUMPER	10MM
		PSSW261C0X	PRINTED W.BOARD	
CN301		YJF07S018Z	JUNCTION JACK	B78-XH
CN302		YJF04S043Z	JUNCTION JACK	B48-XH
CN303	CN304	YJF03S042Z	JUNCTION JACK	B38-XH-A
C302L	C302R	CQPC182JEN	POLY. FILM CAP.	1800PF 100V 5%
C303L	C303R	CQPC333JEN	POLY. FILM CAP.	.033UF 100V
C308L	C308R	CQPC102JEN	POLY. FILM CAP.	
JU302		ACCN834ULA	CONN. CORD ASSY	
J301	J302	YJP04S022U	RCA JACK	AJC-002-AAB
J303				
Q301L	Q301R	QTK0270XAT	TRANSISTOR	2SK270 BL.V-RANK
S301		SP04BCX02A	PUSH SWITCH	
S302		SP023AX04A	PUSH SWITCH	
S303A	S304A	SS040209ZA	SLIDE SWITCH	
U101		QQM04560AJ	I.C.	NJM4560

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ASSEMBLY CODE	ASSEMBLY NAME
APSPW064BA	P.W.BOARD ASSY.

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
		MW2018S001	TERMINAL	
		PSPW064C0X	PRINTED W.BOARD	
B801		BSP83010NN	BIND HEAD SCREW	+ 3IT, M3 X 10 S-NI
C801	C802	CET1Y68201	ELYT. CAPACITOR	
C803	C804			
C805		CKDE103PEM	CERAMIC CAP.	0.01MFD 500V -0, +100% E
D801		QDS10V320K	SILICON DIODE	S10V320
HS801		MH322AA003	HEAT SINK	
R810	R811	RG2ARJ2223	M-OXIDE FILM R.	2W 2.2K OHM 5%

ASSEMBLY CODE	ASSEMBLY NAME	DESCRIPTION AND SPECIFICATIONS
APSSW261AD	P.W.BOARD ASSY.	

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
		MW401CX006	SHRT JUMPER	10MM
		PSSW261C0X	PRINTED W.BOARD	
CN301		YJF07S018Z	JUNCTION JACK	B7B-XH
CN302		YJF04S043Z	JUNCTION JACK	B4B-XH
CN303	CN304	YJF03S042Z	JUNCTION JACK	B3B-XH-A
C302L	C302R	CQPC182JEN	POLY. FILM CAP.	1800PF 100V 5%
C303L	C303R	CQPC333JEN	POLY. FILM CAP.	.033UF 100V
C308L	C308R	CQPC102JEN	POLY. FILM CAP.	
JU302		ACCN834ULA	CONN. CORD ASSY	
J301	J302	YJP04S022U	RCA JACK	AJC-002-AAB
J303				
Q301L	Q301R	QTK0270XAT	TRANSISTOR	2SK270 BL.V-RANK
S301		SP04BCX02A	PUSH SWITCH	
S302		SP023AX04A	PUSH SWITCH	
S303A	S304A	SS040209ZA	SLIDE SWITCH	
U101		QQM04560AJ	I.C.	NJM4560

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ASSEMBLY CODE	ASSEMBLY NAME
APSSW262AA	P.W.BOARD ASSY.

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
		MW2018S001	TERMINAL	
		MW401CX006	SHRT JUMPER	10MM
		PSSW262C0X	PRINTED W.BOARD	
JS01		YJS03S024Z	PHONE JACK	
JUS01		ACCN840ULA	CONN. CORD ASSY	
RS01	RS02	RG2ARJ391B	M-OXIDE FILM R.	2W 390-OHM
RVS01	RVS02	RPGNB10301	SEMI-FIXED VR.	10K OHM B-CURVE
SS01		SP02BAX05A	PUSH SWITCH	

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ASSEMBLY CODE	ASSEMBLY NAME
APSTU066BD	P.W.BOARD ASSY.

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
		MW201BS005	TERMINAL	
		MW401CX001	SHORT JUMPER	JW-10
		MW401CX002	SHORT JUMPER	
		MW401CX003	SHORT JUMPER	
		MW401CX004	SHORT JUMPER	JW-5
		MW401CX005	SHORT JAMPER	JW-15
		MW401CX006	SHRT JUMPER	10MM
		MW401CX010	SHORT JUMPER	
		PSR651*2CX	PRINTED W.BOARD	
		PSTU066C0X	PRINTED W.BOARD	
CN201		YJF07S018Z	JUNCTION JACK	B7B-XH
CN202		YJF03S042Z	JUNCTION JACK	B3B-XH-A
CN203		YJF08S028Z	JUNCTION JACK	B8B-XH
CN204	CN206	YJF04S043Z	JUNCTION JACK	B4B-XH
CT102	CT103	CTX1080P06	TRIMMER CAP.	
CT104				
CT105		CTZ6100H01	TRIMMER CAP.	
CT106	CT107	CTX1150P01	TRIMMER CAP.	
C116	C130	CKV1223N2Y	CERAMIC CAP.	.022,16V,Y,+30% AXIAC-TYPE
C131	C133			
C134	C135			
C136	C137			
C138	C139			
C140	C143			
C145	C146			
C147	C148			
C149	C150			
C152	C153			
C154	C158			
C159	C162			
C163	C166			
C171	C173			
C174	C176			
C178	C180			
C183	C184			
C189		CQSC431JCF	STYROFLEX CAP.	430PF 100V -5, +5%
C191	C201	CKV1223N2Y	CERAMIC CAP.	.022,16V,Y,+30% AXIAC-TYPE
C206				
C226	C227	CQSC102JCF	STYROFLEX CAP.	
C239		CKV1223N2Y	CERAMIC CAP.	.022,16V,Y,+30% AXIAC-TYPE
C241		CQSC102JCF	STYROFLEX CAP.	
C246	C247	CKV1223N2Y	CERAMIC CAP.	.022,16V,Y,+30% AXIAC-TYPE
C248	C249			
C250	C251			
C257		CQHC222JEN	POLYESTER CAP.	
D102	D103	QDCV1320AW	VARI-CAP. DIODE	KV1320 4PCS.
D104	D105			
D106		QDCV1226AW	VARI-CAP. DIODE	KV1226
D108	D109	QDSMA150XN	SILICON DIODE	MA150 VF 1.2V,VR 35V NO-RANK 24MIN
D110	D111			

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ASSEMBLY CODE	ASSEMBLY NAME
APSIU066BD	P.W.BOARD ASSY.

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
D112	D113	QDG1N60XXT	GERMANIUM DIODE	1N60 NO-RANK
D114	D115			
D116	D117	QDSMA150XN	SILICON DIODE	MA150 VF 1.2V,VR 35V NO-RANK 24MIN
D201		QDZA1062MN	ZENER DIODE	MA1062M
D202	D203	QDSMA150XN	SILICON DIODE	MA150 VF 1.2V,VR 35V NO-RANK 24MIN
D209	D210	QDG1S188FC	GERMANIUM DIODE	1S188FM1 VR -35F 26MIN
D211	D212			
D213				
D214	D215	QDSMA150XN	SILICON DIODE	MA150 VF 1.2V,VR 35V NO-RANK 24MIN
D216	D217			
D218	D219			
D220	D221			
D222	D223			
D224	D226			
D227				
FL101		FB10R7F26M	CERAMIC FILTER	SFE10.7MX1 RED
FL102		FB10R7F30M	CERAMIC FILTER	
FL103		FB10R7F27M	CERAMIC FILTER	SFE10.7MX2 RED
FL104	FL105	FB10R7F20M	CERAMIC FILTER	
FL107		FBR450A04M	CERAMIC FILTER	450KHZ BPF AM BFU450C4N
FL201		FF10R7A01N	XTAL FILTER	
FL202	FL203	FJRR38F01C	MPX FILTER	TF10 KOHRIN
J101		YTD02S005Z	TERMINAL	JALCO
L101		LF151KA01T	R.F.C.	
L102	L103	LCADA3038A	RF COIL	
Q101		QTL0045XAB	TRANSISTOR	3SK45 B-RANK PC 330MW, FT 200MHZ
Q102		QTL0073XAT	TRANSISTOR	3SK73 Y-RANK PC 300MW, FT 100MHZ
Q103		QTC1674XAA	TRANSISTOR	2SC1674 L-RANK PC 250MW, FT 600MHZ
Q104	Q105	QTC2926XAX	TRANSISTOR	
Q106		QTC1675XBA	TRANSISTOR	2SC1675 K,L PC 250MW, FT 250MHZ
Q107		QTCJC500BQ	TRANSISTOR	JC500 P.Q-RANK PC 300MW, FT 100MHZ
Q201	Q202	QTAJA100BQ	TRANSISTOR	JA100 P.Q-RANK PC 300MW, FT 50 MHZ
Q203	Q204	QTCJC500BQ	TRANSISTOR	JC500 P.Q-RANK PC 300MW, FT 100MHZ
Q205	Q206			
Q207	Q208	QTAJA100BQ	TRANSISTOR	JA100 P.Q-RANK PC 300MW, FT 50 MHZ
Q209		QTC1846XAN	TRANSISTOR	2SC1846 Q,R,S PC 1.2 W, FT 200MHZ
Q213		QTAJA100BQ	TRANSISTOR	JA100 P.Q-RANK PC 300MW, FT 50 MHZ
Q214		QTC1843XBA	TRANSISTOR	2SC1843 E-RANK PC 250MW, FT 110MHZ
Q215	Q216	QTCJC500BQ	TRANSISTOR	JC500 P.Q-RANK PC 300MW, FT 100MHZ
Q217	Q218			
Q219		QTAJA100BQ	TRANSISTOR	JA100 P.Q-RANK PC 300MW, FT 50 MHZ
Q220		QTK0030XBT	TRANSISTOR GR	2SK30 GR-RANK PC 100MW, FT 120MHZ
Q221	Q222	QTK0136XAN	TRANSISTOR	2SK136 Q-RANK PC 250MW, FT 1MHZ
Q223		QTK0117XAT	TRANSISTOR	BL-RANK 2SK117
Q224	Q225	QTCJC500BQ	TRANSISTOR	JC500 P.Q-RANK PC 300MW, FT 100MHZ
Q226		QTC1675XBA	TRANSISTOR	2SC1675 K,L PC 250MW, FT 250MHZ
Q227		QTA0933XAX	TRANSISTOR	2SA933 R-RANK PC 300MW, FT 140MHZ
RV101		RPGNB50301	SEMI-FIXED VR.	50K OHM B-CURVE
RV201		RP1NB50201	SEMI-FIXED VR.	5K B V8K4-11 B5K
RV203	RV204	RPJNB10306	SEMI-FIXED VR.	TM8K V2-15 B10K OHM

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ASSEMBLY CODE	ASSEMBLY NAME
APSTU066BD	P.W.BOARD ASSY.

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
RV205		RPJNB47202	SEMI-FIXED VR.	4.7K OHM B-CURVE
RV206		RPGNB10401	SEMI-FIXED VR.	100K OHM B-CURVE
R168		RQBCG2201X	M-OXIDE FILM R.	1/4W 2.2K-OHM 2%
R256	R257	RQBCG1602X	M-OXIDE FILM R.	1/4W 16K-OHM 2%
R276		RQBCG2402X	M-OXIDE FILM R.	1/4W 24K-OHM 2%
SL101		M3763SS001	SHEILD.A	
SL102	SL103	MS635SS002	SHEILD.B	
T102		TR10MQ002M	RF COIL	
T103	T104	TR10MQ003M	RF COIL	
T105		TR10MQ005M	RF COIL	
T106	T107	TR10MA013S	IFT	
T108				
T109		TR10MM024K	I.F.T	
T110		TR10MM025K	I.F.T	
T111		TR10MP007S	RF COIL	
T112		TR07LA035S	I.F.T.	
T113		TR07LY001S	I.F.T.	
T114		TR07LM003S	I.F.T	
T115		TZ10AD001K	MPX COIL	
U101	U102	QQM05215AE	I.C.	M5215L
U103				
U104		QQM01235AC	I.C.	LA1235
U106		QQM01245AC	I.C.	
U201		QQM03381AC	I.C.	LA3381
U202		QQ004001AN	I.C.	MN40018
U205		QQM11225AB	I.C.	HA11225 FM-IF SYSTEM
ZZ1	ZZ2	ZZZ0000193	F-BRAID WIRE	4X45 S-S SOLDER

ASSEMBLY CODE	ASSEMBLY NAME	DESCRIPTION AND SPECIFICATIONS
APSVR025AA	P.W.BOARD ASSY.	

SYMBOLIC OR EXPLODED VIEW NO.		PART CODE	PART NAME	DESCRIPTION AND SPECIFICATIONS
		MW401CX006	SHRT JUMPER	10MM
		PSVR025C0X	PRINTED W.BOARD	
SV01		SP013AX01A	PUSH SWITCH	
VRV01		RSH1A15B01	SLIDE VR.	

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